PAVING AND MUNICIPAL ENGINEERING

A Journal Devoted Specially to Street and Sidewalk Paving, Sewerage, Water-Works Construction, Street Lighting, and all Matters Pertaining to Municipal Engineering.

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Communications are invited, and all requests for special information on the subjects treated by this journal will receive careful attention.

Articles relating to the different branches of municipal engineering are desired. Stamps should accompany manuscripts for return postage if unavailable.

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The columns of this publication are open to the discussion of all subjects relating to paving, sewerage, water-works, street-lighting, and the physical improvement of cities. Practical information as to the merits of materials used in such work and new methods, with photographs and drawings, which may be used for illustration, are especially desired. We are glad to get brief notes as to proposed improvements and the letting of large contracts.

City engineers are requested to send us as early as possible copies of their annual reports, which will be given proper notice.

Articles relating to methods of road making and maintenance are invited.

PUBLISHERS' ANNOUNCEMENT.

It is with much gratification that we are enabled to announce that the steady growth of the substantial patronage of PAVING AND MUNICIPAL ENGINEERING warrants an enlargement and improvement which will distinguish it as one of the most notable publications in America, not alone in a particular class, but in the general field of technical literature.

Beginning with the January number it will be changed to magazine form, largely increased in size, with new features throughout, and with a degree of general excellence which will, we believe, surpass expectations. The assurance may here be given that the high standard which will characterize the first number in the new form will be maintained in succeeding numbers. The publishers have made and will make no promises which they will not fulfill. Those who have watched the course of the publication from the time it was started will understand well what this means when we announce that we are now prepared to promise more than ever before.

Arrangements for the new departure have been in progress for several months, and the work preliminary to it has been done with care, so that the publishers can speak with confidence as to the progressive plans which they have long been developing. Aside from making the publication the finest that can be produced, it will contain the best special articles on the subjects coming within its scope that can be obtained.

Arrangements have been made with Major J. W. Howard, B. L., C. E., who has recently returned from a trip through Europe, for a valuable series of articles on municipal engineering, the first of which will be on the subject of "The Municipal Equipment and Engineering of Paris," which will be followed by others. The general character of these articles is well explained in the following letter from Major Howard:

NO. 1 BROADWAY, NEW YORK, Sept. 27, 1892.

To the Editors of Paving and Municipal Engineering:

SIR—In accordance with your request I am preparing a series of short articles based upon memoranda made during my last visit to Europe to examine into certain branches of municipal engineering. The city of which it seems best to first treat is Paris, which for so long stood as the best equipped municipal plant in the world. If time permits I will afterward review certain branches of city engineering in which Paris is now surpassed by other cities.

While the articles will treat, in large part, of technical matters, it seems best that I should clothe them in popular language as far as possible, and perhaps thus make them attractfve to the large number of general readers who, in addition to technical men, read your publication. Very truly yours, J. W. HOWARD.

A new series of practical articles relating to the general subject of street-paving will also be furnished by Mr. Louis H. Gibson, who spent a year and a half in Europe studying municipal engineering, preparatory to putting his information in shape for the readers of PAVING AND MUNICIPAL ENGINEERING.

Mr. D. V. Purington, one of the largest and most successful manufacturers of paving brick in this country, will contribute articles of exceptional value relating to the paving-brick industry.

Mr. William Steyh, one of the pioneers in putting down brick pavements, will furnish an article of special interest and importance on the subject on which he is recognized as an authority.

Other articles are in preparation which will enable the publishers to furnish an ample supply of the best obtainable special knowledge on the subjects coming within the scope of this publication.

The date of publication will be changed from the 15th to the 1st of the month, and the subscription price, beginning with the January number, will be $2.00 a year.

STREET PAVEMENTS IN BRUSSELS, ROTTERDAM AND AMSTERDAM.

By Louis H. Gibson, Our Special Representative in Europe.

THERE is very little asphalt used now in either Glasgow or Edinburg, proportionately no more in Liverpool, though relatively more in London. In Paris it is used more extensively than in any of the cities mentioned though it is not being put down as much as in former years, nor is it being used as extensively as wooden blocks. In traveling through the other cities of France I have found a little asphalt in all of them. It all looks well, is solid and substantial and seemingly satisfactory, but little of it is being used on new streets. Wood is the favorite material for the new covering of the boulevards. Brussels, which is called the little Paris—which, by the way, is a false appellation—has used asphalt to about the same extent as some of the small French cities. It, too, has taken somewhat of a turn towards wood. Rotterdam and Amsterdam each have a little asphalt, very well laid, though they do not seem to be disposed to use a great deal of it. This, I judge to be more from economical reasons than otherwise in these two cities. While they are fond of good streets, they are much more careful in the use of money than the French or Belgium cities.

This slight revival of the use of wood pavement is in the direction of an effort to get something less slippery and less noisy than asphalt. I do not think that any one pretends that the wood pavement is much, if any, cheaper, as to first cost, that it lasts as long or can be maintained at anything like the same cost as asphalt. Again, I do not think that the continental cities have had the same experience with wood that is common to both those of Great Britain and America. Contracts have recently been made in Paris for wood pavements under special guarantee to last six years. The price was such that it would admit of some considerable attention. As to one of these streets, I saw men renewing blocks in it within three months after the pavement had been laid. These pavements are somewhat less noisy than the asphalt. They are quite as slippery, and, because of the absorbent qualities of the wood, in time grow quite foul while the asphalt will remain pure and free from odor if properly cleaned. From what I can see and gather from the history of wood pavements, their increased use here and the neglect of asphalt are altogether irrational. Not that I believe asphalt to be ideal or that the ideal pavement has been brought forth. However, a good asphalt pavement will outlast two or three wood pavements; is no more slippery than wood, is smooth, and is capable of being readily and economically cleaned. Asphalt pavement, in common with stone and wood, is very slippery and to that extent hard on horses.

I was talking to a contractor recently about guaranteeing pavements. He said that it is quite absurd to ask that it be done; that any contractor who guarantees a pavement gets more for it because of the guarantee than it would cost the municipal organization to keep the street in repair. A contractor not only has to figure on the possible and probable repairs, but also to make allowances for certain work which he will be asked to do, which, while it does not properly belong to him, it will be wiser for him to do because of the cost attached to maintaining his proper position in the matter by contesting it. Furthermore, the large amount of capital which is risked in a pavement must be properly protected, in case of a guarantee, which protection, in itself, suggests cost. No one is going to place any large sum in jeopardy for several years without compensation. Again, in the cities of the new world, where changes are rapid, where cities grow quickly and where the course of business is liable to fluctuation and change, no one can estimate just what the wear will be on any pavement. Furthermore, a pavement should have certain attention from the city, in keeping it clean, in order to give it proper life. If a street is not well cleaned, many things may happen to it which will affect the character of the original work. Altogether, it is better that a municipal organization should do business with first-class contractors. See that the material is of a specified character and require absolute renewal in the case of faulty material or workmanship; but not long guarantees on general principles. "It is true," said this contractor, "that paving guarantees rarely amount to anything. The contractor generally gets more out of them than the city. In the interest of all around justice, I would like to see them done away with."

I have been not a little interested in the brick pavements I have seen in this country, first in Brussels, afterwards in Rotterdam and Amsterdam, but latterly at The Helder, a city of about twenty-five thousand inhabitants located between the North Sea and the Zuyder Zee. This city is entirely paved with brick, as are also the roads connecting with the neighboring towns. I rode over as beautiful a piece of street about a mile in length, reaching from The Helder to Nieuwe-Diep, as it has ever been my fortune to pass over. It was not noisy, was smooth, easy-riding, and, notwithstanding the fact that it was wet, it was not at all slippery. The sight of these beautiful streets, the pleasure of driving over them, their extended history, has meant a good deal to me, as I believe it would to any one interested in this question.

Brick appears to have the quality necessary for a satisfactory roadway. They are certainly not so noisy for travel as wood, and the character of their surface, the joints between them, appear to make an ideal footing for a horse. Brick comes as a natural material to this section. Stone is out of the question excepting it be brought from the Norwegian peninsula. Wood is very expensive.

Helder, Holland.

SUITABLE CLAYS AND PROCESSES OF MAKING PAVING BRICK.

MESSRS. W. S. RAVENSCROFT and H. A. Miller, of Williamsport, Pa., have written a pamphlet of seventy-five pages on "Brick and Brick Roadways," in which they give much information on materials, process of manufacture and methods of laying paving brick and incidentally they also discuss other kinds of paving.

On the subject of suitable clays and the manufacture of vitrified brick they say:

"Clay, a term applied in a general way to those kinds of earth or soil which, when moist, have a notable degree of tenacity and plasticity. The clays are not easily distinguishable as a mineral specie, but they all appear to owe their origin to the decomposition of other minerals and to consist chiefly of alumina in combination with silica and with a certain amount of water. The two materials that are used for the manufacture of paving brick are generally known under the term clay; technically speaking one is a low grade of fire-clay, the other an argillaceous shale. Paving brick are manufactured from each of these materials separately and in combination, a brief description of the fire-clay being as follows:

"It is a hydrated silicate of alumina usually containing traces of magnesia, iron, lime and potash, which makes it more easy to fuse. Lime is a dangerous element, a very small percentage of which may, under heat, be converted into quick-lime and by exposure to moisture cause it to slack and disintegrate the brick, but a percentage of magnesia is beneficial, producing vitrifaction. A percentage of iron in the clay is also of value, assisting in the same manner as does magnesia. It is, however, the alumina in the

brick which gives it its elasticity, renders it tough and binding, and rapidly fusing when in contact with silica.

"Fire-clays are found in the coal measures, the fire-clays from which paving brick are made coming, in most instances, directly from beneath the veins of coal. Nearly all the coal measures in Pennsylvania are underlaid with from two to four feet of this grade of clay, any one of which will produce alone a fair paving brick. The manner of mining these clays is usually to follow after the coal miner and take up the bottom, or fire-clay, after the coal has been removed. In many instances, where the veins of coal are not of profitable thickness to work, the coal and clay are mined together, the coal furnishing the fuel in the manufacture of the brick.

"It is our opinion that few single clays will, however, alone produce a satisfactory paving brick. The essential qualifications are that it shall be impervious to water and homogeneous. Such conditions as these can result only from a mixture of different clays finely ground and thoroughly incorporating the proper proportion of infusible material, which will enable the brick to stand up in the kiln and retain its shape, while its other parts melt and run together, thus uniting the whole into an impervious and solid mass. These results are more successfully obtained where a vein of low grade fire-clay can be had convenient to a bed of argillite containing the necessary amount of alumina and iron. Silica expands under heat, alumina contracts. The effect of this combination is that the expansion and contraction in burning is reduced to a minimum, thereby avoiding cracks throughout the brick, caused by the drawing and twisting under heat, as is the case with brick that shrink greatly.

"Shale, or slate clay, is an indurated clay which often forms beds in the coal measures. It is chiefly composed of silica and alumina in variable proportions, and also frequently contains a considerable amount of carbonate of lime and oxide of iron. It is of a gray or grayish-black color, also of brownish-red when containing much iron. Its structure is more or less slaty.

"Shale varies much in its composition. Clay, sand, iron and bitumen, either singly or any mixture of them, are included under the name, if they form rocks which split in layers in direction of their bedding. Clay, however, is an ingredient in most shales. Slate, schist and shale are names employed to denote those kind of rocks which are laminated or fissle; that is, which possess structure rapidly splitting into thin layers. Shale and schists are almost synonymous, although the latter should be restricted to rocks with their layers irregular or foliated. There are scarcely any two shales given the same analysis.

"Shale is found in various positions in the earth and ranges in thickness from a few inches to hundreds of feet, and if properly manipulated, some of it will produce the finest brick for ornamental architectural work, while most of it is suitable as one of the constituent parts of paving brick.

"We are not advocates of a paving brick made exclusively of either fire-clay or shale, but prefer an admixture of the two, of which more will be said later.

"Shale is mined frequently in a manner similar to that of fire-clay; oftentimes, however, it is cheaper to strip it.

"After having secured a clay that is thoroughly adapted to this use, the first important move is the preparing of it. It is absolutely necessary to reduce it to as great a degree of fineness as is possible, the finely divided particles being more easily bonded in the pug and more readily vitrified in the kiln. The best way to obtain this result is first to crush the material in an ordinary dry pan, of which there are a number on the market. The dry pan, we might say, for the benefit of the inexperienced, is a revolving pan containing two heavy rolls, weighing from one to three tons each, working upon the solid bottom of the pan. Immediately surrounding this solid bottom are a series of perforated plates extending to the rim of the pan. The material as it is crushed beneath the rolls is scattered over these perforations by the centrifugal motion of the pan, and those particles sufficiently fine are sifted through, while the coarser ones are, by means of scrapers, thrown back again under the rolls. After passing through this perforated bottom, the whole is scraped into a bin, or boot, from which, to a height of probably thirty feet, is extended a belt containing a series of buckets, by which means the clay is elevated to a screen, and over which the clay again passes, still further reducing the particles in size. There are two kinds of screens, stationary and revolving, from either of which good results are obtained. Either wire or perforated plates can be used for screening surface; if of wire, about fourteen mesh will produce a satisfactory degree of fineness; if of perforated plate, about 3-32.

"From the screen the clay drops, by means of a chute, into a pug-mill, where sufficient water is added to moisten the particles, and is here pugged into a stiff mass.

"From the pug-mill, which is usually placed at an elevation of from two to four feet above the brick machine, the clay enters the mouth of the latter machine, which is equipped with an auger, being large at the entrance and tapering to a point at the mouth, and which takes the pugged clay, and by compressing it into a reduced space, forces it from the mouth of the machine into a continuous stream of stiff mud, where it is cut into the desired shape by means of wires adjusted for the purpose and manipulated by a lever.

"We have here described what is known among brick-makers as the stiff mud process, which is the popular process to-day for making paving brick. It is claimed that there have been produced good pavers by the dry press process, also by the soft mud machine; but of each of these two processes, as applied to the manufacture of paving brick, we require more information than we have as yet been able to obtain.

"The brick can or not be repressed at the option of the manufacturer. While it costs a little to repress a brick, it adds density and improves the appearance of it; and also, if desired, imprints the brand.

"The manner of drying a brick should be thoroughly looked into, as clay differs materially. Some clays will dry readily by steam, others by hot air, and still others by natural heat, while reversing the manner of drying these same clays might cause them to crack or to craze. A large percentage of clays can, however, be dried by any of these processes. The steam drier seems to be the most popular, and inasmuch as it reduces the handling of brick, by the use of tracks and cars, to a minimum, where the cost of fuel is an item, it is especially to be desired.

"After the brick have been thoroughly dried, they are run upon the same cars into the kilns, where they are set for burning. It is unnecessary to describe the setting of brick in the kiln, inasmuch as they are of uniform shape and require no expert handling other than setting them substantially so as to leave room for the draft and maintain them in a solid, upright position while undergoing the shrinkage which takes place, heading courses being run at intervals to stay them in their position. They should not be set to too great a height in the kiln until it has been ascertained what weight they will sustain under heat, as some clays will crush out of shape if set too high. This can only be determined by actual test of the material.

"It is a difficult matter to advise or describe the manner of burning brick, while to the casual observer it is an easy matter to shovel coal into the fire boxes for a given length of time, and then cool and wheel them out, but it is a much more difficult matter to produce an article that meets with ready sale. The novice in brick making usually starts out with more dollars than experience, and expects that his chief difficulty will be his inability to supply the trade that will come begging for his brick, but his first few kilns will convince him otherwise. Ordinarily a small fire is built in the kiln, which is slowly increased for a period of from thirty to forty-eight hours. If the kilns are down-draft, the dampers in the stacks are closed and the steam allowed to escape from the vent holes in the top of the kiln. This should be continued just as long as there is any evidence of moisture noticeable. When this has disappeared, then the vents may be closed, the damper raised, and firing commenced in earnest, gradually raising the heat until a sufficient degree has been obtained.

"Many writers upon the subject of vitrified brick discuss as

length the annealing of the material, alleging that this process renders it tough. It is our belief and experience that when the burning of a brick has been finished it is as tough as it is possible to make it, and that the only thing necessary is to see that the cooling process is not too rapid. Whenever brick produced from reputable material are brittle, it is due, in most cases, to too rapid cooling. This means an unequal contraction, which causes numerous invisible air cracks, rendering the brick unfit for use in the roadway.

"In this particular part of brickmaking it is highly important to have a practical man, as successful burning is usually done by the eye. By this is meant that the eye of the practical burner tells him when the heat has reached a sufficient degree. Some brickmakers have a habit of using tongs, by which, at intervals, they pull out a brick and examine it, but those who burn by this method can not be classed as expert burners.

"The cooling off of a kiln should be very gradual, as the admission of cool air in the slightest degree has a tendency injurious to any brick, and especially to paving brick. After the heat has been allowed to die out slowly, the doors are knocked down and the brick are wheeled to the cars by means of barrows especially constructed for the purpose.

"The plant should be built as compactly as possible. Everything should move on a down grade. The level of the yard should be, if possible, about four feet above the railroad track. This enables the cars to be reached without wheeling up a grade. At least two tracks should be provided, as in this manner several cars can be loaded at the same time, which is sometimes important in filling orders on short notice. There should no great space exist between the drier and the kilns. The stock sheds should be placed between the kilns and the railroad tracks, so that, if the bricks are stocked, they will have completed at least a part of their journey to the cars, thus avoiding any retracing of steps. If possible, have the trade so well in hand as to render stock sheds unnecessary. This latter piece of advice, however, may be difficult to follow.

"As vitrified brick is the term generally used in specifications supplied to contractors, it is necessary to say something upon the subject of vitrifaction.

"There seems to be a doubt as to what is meant by the term vitrifaction. Those whose duty it is to inspect pavements are not always fully informed on this point. Brick that are not vitrified sufficiently, and often not vitrified at all, are frequently used for paving the streets of important cities and towns, and inspectors who examine and report on this work make favorable returns, when, in fact, the brick in no respect comply with the contract required. This is due, not because of the desire to accept imperfect work, but in most cases on account of misinformation. Brick for street pavements, while they have in some places been used for a number of years, are comparatively a new thing; and it does not follow because a man has visited the different cities as a member of a committee to examine work and material used, that he knows a vitrified brick when he sees it. It is not to be expected that he should know what is the best material or the best method of constructing pavements. Civil engineers are frequently in error in this respect from the same cause. So far as their work is required they are a good thing, but whether civil engineer or any other person who has just taken up the question, it is not reasonable to suppose that they can be competent judges of what has required the time and study of the brickmaker for years.

"A vitrified brick is one that has been subjected to a degree of heat sufficient to cause the fusible ingredients of the clay to unite the particles together into a homogeneous mass. Unless this degree of heat has been sufficient the vitrifaction will only be in part. When the brick are not molded dense and closely compacted, and the vitrifaction has not been sufficient to unite the mass into a solid body, but has fused it only enough to unite the particles at their points of contact, it leaves the brick porous and unfit for use as a paving brick. An additional degree of heat and greater density would have rendered this same clay a satisfactory paver. A brick should contain just as much clay as is possible to compress within a given space; it should then be brought to a sufficient degree of heat to fuse and unite together into a glassy substance those ingredients susceptible of heat. Such a vitrified brick, all other qualities being satisfactory, is what is wanted.

"Any vitrified brick is necessarily, from the very definition of the term, to a certain extent brittle; and this same brittleness is an indication of its anti-frictional qualities; and while some of the tests to which it is subjected by *inexperienced experts* may shut it out, yet this does not conclusively demonstrate its unfitness as a paver.

"We frequently hear of semi-vitrified brick, by which is meant a brick partially vitrified, and is an effort on the part of the authors of specifications to combine in the term that hardness and toughness required in a good paver. Such a term is misleading and incorrect. The vitrifaction of a brick commences on the outside and extends to the center. If a brick be semi-vitrified at the surface, there will be no vitrifaction at the center; hence, such a brick will not fill the requirements. We have seen brick apparently vitrified, from which, upon tapping them with a hammer, a shell would fall, thus exposing a granular, and in some instances, a soft interior. On the other hand, there are clays that vitrify so easily that unless the brickmaker is very careful his entire kiln will run together into one common mass, but such a clay is not likely to cut a figure in the production of a brick for paving purposes."

CLASSIFICATION OF ASPHALTS.

To the Editor of Paving and Municipal Engineering:

SIR—In your last issue I find an article entitled "The Nomenclature of Asphalt and Bituminous Products," which contains the arrogant assumption of Mr. Leon Malo, seconded by Mr. W. H. Delano, to decide for the world what should be called asphalt and what not. With the "we" in "We call in Europe, and shall continue to call, asphalt limestone naturally impregnated with bitumen, which has the property," etc.

Mr. Delano and Mr. Malo is evidently meant, because other engineers have learned the difference since the Trinidad asphalt came in the market as a street paving material, if they did not know it already from a book, "The Geology of Trinidad," by Wall & Sawkins, published in 1860 by order of the Lords Commissioners of Her Majesty's Treasury. These eminent geologists had the audacity to disobey the directions of Mr. Malo of 1857, and called the Trinidad pitch "asphalt," and mentioned on page 463 that at Seyssel, department of Ain, a bituminous limestone occurs, which contains ten per cent. of asphalt.

The communication by Leon Malo has for its object the confusion of the public mind and the reason for wishing to do so is very clear to those who know that the company to which Mr. Malo and Mr. Delano belong has lately finished the construction of large asphalt works in Long Island City, N. Y., with the object to enter into active competition with the existing companies doing business in the United States. Therefore it would suit Messrs. Malo and Delano exactly to have the public believe that their company is the only company which can lay genuine asphalt streets, and in order to make it very emphatic got Mr. L. H. Gibson, who, for want of knowledge, was easily duped, to call the American asphalt streets counterfeits and imitations.

Now, the name "asphalt" was given long before Leon Malo was born, even long before the name of Malo was invented, to a certain primitive compound belonging to the class of hydro-carbons. This compound is found partly by itself, almost pure, partly mixed with other substances as clay and sand, and partly in condition impregnating limestone rocks or sand rocks.

What right had Mr. Leon Malo to use the term "asphalt" for his asphaltic limestone, which only contains ten per cent. of "asphalt" or bitumen? None! It is not true, and even were it so, it is no argument or excuse for him to say that because he has used this wrong term for his bituminous lime rock for twenty years without opposition he has a title or a patent to the term

The geologist mentioned before probably did not know in 1860 that such an engineer by the name of Leon Malo existed, or did not consider it worth their while to refute his assumption, but it is evident that they differed with him very materially.

If there was no other opposition to his wrongfully using the term of "asphalt" for the period mentioned, it probably was because nobody had any interest in opposing him, as the other asphalts had not come into the market as paving materials. Unfortunately, his attempt in 1857 "to clear up the utter confusion of language," has resulted in an increase of such confusion, and his persistent effort to keep it up has no other object but to depreciate other asphalts in the mind of the public.

He, Mr. Malo, says: "The principal ingredient in the application of the product in question to street-work is the matter known as mineral pitch or bitumen." He leaves the term, "asphalt," out, which properly belongs to it, and had been given to that described substance hundreds of years ago.

His system of classification is therefore perfectly ridiculous, and far from simple and logical, and has by no means been adopted by European countries, for which I will bring him the proofs.

A classification, which has been adopted by most of the engineers of the United States acquainted with the different kinds of asphalts, is at once descriptive and correct. The bituminous limestones are called, "rock asphalts," and designated further by the name of the mine where found: "Val de Travers," "Seyssel," "Sivilian," "Gimmer," "Vorwohle."

All the other asphalts, either pure or mixed with clay and sand, are designated simply by the term, "asphalt," with the place of occurrence attached: "Trinidad asphalt," "Cuban asphalt," "Mexican asphalt," "Venezuela asphalt," "Kentucky asphalt," and many more.

Seyssel rock asphalt pavement means a pavement laid with bituminous limerock mined at Seyssel.

Trinidad asphalt pavement means a pavement laid with asphalt brought from the Island of Trinidad.

This system of classification tells the whole story. If we should attempt to classify the Trinidad asphalt into sub-classes, the system would be a little more complicated. There is an attempt to classify the Trinidad asphalt into lake overflow and land asphalt. The lake asphalt might be further specified, as coming from the mathematical center thereof, or 100, 200, 300 feet, etc., from it. Further, the overflow asphalt might be designated as coming one yard or two yards from the edge of the lake. The land asphalt might be classified by greater distance from the center of the lake, say 1,000 feet, 2,000 feet, etc., until the ocean is reached. Another classification might be made, as suggested by the chemist, who thinks he examines the refined asphalt, by analyzing the crude material. He suggests the fusion point, which he finds, and he alone differs from 70 to 80° Farh. Such classification, according to the "fusion point," I think more properly called the "con-fusion point," would be beautiful. But I will not attempt to interfere with his classification, as it has nothing to do with the subject before me.

It is nonsense for Mr. Leon Malo to say that others want to apply to themselves the profits of his and his company's renown. The renown of his company is not so great as he evidently imagines. I have stated before that 1,000,000 square yards have been laid in thirty-four years in the different cities of Europe, of which Mr. Malo and Mr. Delano's company has probably laid about 350,000 square yards; other companies have laid the rest. In the United States nearly 10,000,000 square yards have been laid in eighteen years, or 540,000 square yards per year against the 30,000 square yards in Europe. To-day, in the city of Paris, the seat of Mr. Delano's company, the wood pavement is the most favored pavement. Where is, then, the renown of Mr. Malo and his company? But in the United States to-day, the most favored pavement is the asphalt pavement, the genuine (not the counterfeit, nor the spurious imitations), which is every bit as good, and in some points better, than the Seyssel-Rock asphalt pavement of Malo and Delano, if laid with care and judgment.

If the company represented by Mr. Delano wishes to come over and to compete with the existing companies in this country, let them come on the merits and cost of their pavement, and not with misrepresentations, trying to confuse the mind of the public. Messrs. Malo and Delano may continue to call their pavement the true asphalt pavement as long as they please, but no engineer in the United States will call it other than the Seyssel-Rock asphalt pavement—a name which tells the whole story; that is, a pavement prepared from the bituminous limestone-rock mined at Seyssel.

The proverbs put at the close of the translator's remarks, "Borrowed plumes should not be worn," and "Let every tub stand on its own bottom," are certainly very strong reminders and very applicable to the writer and translator of the article in your last issue, "The Nomenclature of Asphalt and Bituminous Products."

JULIUS SCHUBERT.

New York, Nov. 8, 1892.

STREET PAVING IN ST. LOUIS.

MR. THOMAS H. MACKLIND, district engineer in charge of reconstruction, furnishes the following information regarding the pavements of St. Louis:

Granite.—For manufactory and mercantile traffic, granite set on a base of hydraulic cement concrete, 8 inches deep, 2 inches sand cushion, stone 7½ inches to 8½ inches deep, 3½ inches to 4½ inches wide and 8 inches to 12 inches in length. Cost in St. Louis in 1890, 37 to 42 cents per square foot complete in place, exclusive of curb; curb costs 70 to 90 cents per foot, lineal. This form of pavement has been down eighteen years under a traffic of 6,000 teams per day of twelve hours; width of roadway 50 feet between curbs, cross-section camber 0.60; cost of maintenance one-fourth of a cent per square foot per annum.

Cleaned by horse sweepers, cost per 10,000 square feet swept, 48 cents; swept three times a week; to sweep 10,000 square feet by hand costs from $1 to $2.50.

Two-horse wagons on three- or four-inch tires, loaded, average 7,500 pounds, team 2,400; wagons for hauling railway cables and machinery weigh 9,700; width of tires, fourteen inches; load 97,000 to 100,000 pounds, drawn by forty horses; horses average 1,400 pounds.

Asphalt.—This roadway, laid on Pine street in 1883, is now in good condition after a test of eight years, under a mixed traffic of 4,500 vehicles in twelve hours, from 7 A. M. to 7 P. M. The work was carefully executed, and consists of a six-inch hydraulic cement concrete base, one-half inch cushion coat and two-inch surface of wearing coat; cross-section camber 0.50, width between curbs 36 feet.

Traffic in what may be termed building materials, residence supplies and suburban, while it has been subjected to the heaviest loads hauled in the city with fair results, it must stand below granite for wear. Cost 33 cents per square foot. Maintenance under contract one per cent. per square foot per annum in the case of the roadway cited; maintenance under later contracts half a cent per square foot per annum. The maintenance clause in contracts runs for ten years; the first year at the cost of the contractor. This form of pavement, as laid here, all points considered, stands in the front rank under the conditions indicated.

Telford.—This form of pavement as laid on Lindell avenue consists of a base course of random stone, set broadest face down, in lines at right angles with the street, eight inches deep, finished by wedging spawls into the open spaces, and breaking down the points to a uniform surface, then placing a six-inch course of clean macadam; this is thoroughly rolled by a 10,000 pound four-horse roller, five feet face and five feet in diameter. The surface is then finished with two inches of cement, gravel rolled, then two inches coarse, clean gravel well wetted down and thoroughly rolled to a compact, smooth surface. This avenue is sixty feet between curbs, cross-section camber, equals 0.80, average grade 1 per cent; cost complete, exclusive of curb, twelve cents per square foot.

The traffic as observed in 1892 was 1,600 vehicles in ten hours,

65 per cent. being one-horse vehicles, 15 per cent. two-horse wagons hauling dirt, building material, coal, etc. In 1890 the repairs on this avenue of 469,500 square feet cost half a cent per square foot. Our macadam pavements are finished on the top in the same manner as Telford, costs nine cents per square foot and for a traffic of from 100 to 500 vehicles per day does fairly well. Cost to maintain a macadam pavement under a traffic of 3,200 vehicles in 12 hours on a 34-foot wheelway on Broadway, four cents per square foot per annum; has been reconstructed with granite.

Wood.—This pavement has been in use in a limited way (ten miles) from 1860 to 1882, laid under the Nicholson patents. The average life during that period was six years and three months.

Broadway, 50 feet between curbs under a commercial tonnage of 2,500 vehicles in twelve hours, cost four and a-half cents per square foot per annum. The wood used was cotton wood Burnettized. Decay began to develop from the third to the fourth year. There were a few exceptions on Third street; traffic, 2,400 vehicles in 12 hours, where, with repairs, a six-inch block of prepared cotton wood wore down to one and one-half inches in seven years; width of wheelway, 26 feet; grade, one per cent. All of this pavement was set on inch boards; average cost 42 cents per square foot, six cents per square per annum, without repairs, replaced with granite. Since 1884 the practice has been to set the blocks on a six-inch hydraulic cement concrete base, the channels filled with hot bituminous composition. The channels are formed by iron studs driven in the side of the blocks to the head, which is half an inch. The blocks are treated with chloride of zinc.

This work costs, sweet gum, 35 cents; white pine, 37½ cents to 41, and a half a cent per square foot. Maintenance under a ten years contract, half a cent per square foot. Decay set in in this work at the close of the third year. From the present appearance of these streets, the conditions being the same, the record of wood block pavement will not be changed. In 1890 the first cedar (round block) pavement was laid on Olive street west of Grand avenue, on a 6-inch concrete base. It has the merit of being cheap, costing 20 cents per square foot complete in place, exclusive of curb stone. It is expected to wear from three to five years, when it can be restored say at 7 or 8 cents per square foot, or less, as the lumber market may change. Admitting it to last five years, it will cost 4 cents per square foot per annum, minus repairs. Olive street at the point indicated has a mixed traffic of 900 vehicles in 12 hours. There is a double track cable road also, which forces the traffic on straight lines, thus adding to the wear by adding a tendency to rut.

How Paid For.—All new work, except cross-walks and grading, is paid for by special tax assessed against the abutting property, based on the assessed value of the property per front foot, against which value per front foot, bills can be issued to the amount of 25 per cent. The cost of the work in excess of 25 per cent. of taxable valuation per foot is paid by the city. Reconstruction the same, except the grading, which is included in the tax bills.

Cleaning and Sprinkling.—To reduce the dust nuisance to a minimum in the spring, summer and autumn months is a difficult problem. The first step is to pave the streets, when the cost will not be too onerous on the property; the second is to clean by sweeping, or such other method as will be efficient and least injurious to the street surface in the operation. Freezing, thawing and moisture are especially injurious to the streets or roadways. The destruction from freezing can be reduced to a minimum by perfect drainage, thus relieving the surface of the roadway from moisture, by providing for its rapid discharge from the surface to a depth that will insure the general stability of the work.

The mode of under-drainage where needed will be determined by the character of the sub-grade and other general conditions. One of the points in favor of the Telford foundation is the result of the numerous small openings in the base course of random stone, which acts as drains (until silted up from any cause). They permit the rapid fall of the surface moisture to the sub-grade line and below. It being a self-evident proposition that the drier the roadway the longer the life, and the more efficient the service; at the lowest cost of maintenance, it remains to provide for the elimination of dust and mud from the problem of good streets.

The first step in this direction is perfect cleaning, water being only used to dampen the dust or dirt, so as to allow being swept without smearing, or the dust being thrown into the air by the motion of the broom. Water, aided by broom work, may be used to advantage under favorable conditions to clean granite and asphalt streets, they being practically water-tight. Sprinkling in excess of those purposes should only be employed to cool the streets in hot weather. All paved alleys in the paved district should be swept as often as needed to completely remove all dust and dirt, as the alleys contribute largely to the dust volume, also as a sanitary measure. Telford and macadm streets should, and can, in many cases, be swept to advantage during the dry months, as the dust when wet holds the moisture in the form of a mud plaster to a serious injury of the street surface and consequent greater cost of maintenance.

Brick Pavement.—Pavements of this class failed to give good results in St. Louis under the conditions of traffic, which averaged in one case 1,000 and in the other 3,500, commercial teams in twelve hours, in the first case lasting, set on six inch concrete base, three years, and in the second case set on a sand base nine months, the tonnage in the first instance being 105, and in the second 295 tons to the foot of wheelway. Still the fact remains that good results are attainable under the proper conditions; first, light traffic, a uniform material, making and burning of the brick, and a density that will practically exclude water, and consequent destructive effects of freezing. Traffic may change, but the wet and frost are annuals.

The streets surrounding schools, hospitals, court-houses, city and government buildings, should be paved with asphalt, or wood. Where wood is used, it should be placed on a concrete base, the quality of the blocks being of more importance than the form or shape.

The average life of wood pavements in St. Louis has been from six to seven years, repairs being required in eleven cases from the third to fourth year. After the fourth year repairs were needed in the spring and fall until worn out.

St. Louis has constructed over fifty miles of her streets since 1885 at a cost of over $4,000 000. Good streets and avenues develop business; rapid transit diffuses and prevents overcrowding, adds to the health and comfort of the people. Clean, well paved and maintained streets and avenues are public educators, giving daily object lessons to the sturdy, and maybe, bare-footed newsboy, as he rushes along in search of patrons, catching on the wing, as it were, glimpses of color and artistic finish on the long lines of splendid thoroughfares. In this way the moral tone of the masses thrown together in the great cosmopolitan centers is elevated by eliminating from their daily life unsightly and unhealthful conditions and obstacles in the way of traffic so often found in cities both great and small.

The improvement of our thoroughfares has contributed largely to the development of our street-car service, until St. Louis claims to be at the head of the column of all the cities of the United States and the old world; rapid transit adding 1,100,000 passengers per month carried during the year ending 1891.

Old Bill Culton, of Dunklin county, Missouri, described the case fully in a few words. When asked the distance to St. Louis, he replied, "Dat by ox wagon it took one month, with horse wagon two weeks, and by the steam kars you am dar now!"

Thus it is that good streets and roads lengthen life, as they economize time, make distant people neighbors, facilitate and develop local business, bring new customers and travelers from distant points, and contribute to the sum total of a city's welfare and general progress of the county. Floating roads also enter into the problem of traffic, bringing together distant cities, continents and islands of the seas. Thus it has come about that Europe and America are practically to-day nearer together for business or pleasure than was St. Louis and Chicago forty years ago. No city, country or state can afford to be careless or indifferent to the need of good

wheelways. The legitimate profit from a surplus is often lost to the farmer and the merchant because of bad or deficient transportation facilities.

NATIONAL GOOD ROADS CONVENTION.

IN response to the call for a National Good Roads Convention a number of delegates from interested organizations in different states assembled in Chicago on Thursday evening, October 20th. Among those who were present as reported by the Chicago *Tribune* were Gov. Fuller, of Vermont; Judge Thayer, of Iowa; Gen Roy Stone, of New York; J. H. Hackett, of Jacksonville, Ill.; D. R. Sperry, Batavia, Ill.; S. T. K. Prime, of Illinois; William Fortune, of Indiana; Clem Studebaker, the prominent manufacturer of South Bend, Ind.; William H. Rhawn, Philadelphia, President of the National Bank of the Republic and President of the Bankers' Association; Isaac B. Potter, New York; W. L. Webber, Saginaw, Mich., member of a commission appointed by the Michigan legislature to investigate and report on remedies in the existing road laws; H. W. Thornton, farmer, Mercer county, Ill.; Col. A. A. Pope, manufacturer, Boston, representing the Chamber of Commerce of Boston and the Board of Trade of Hartford, Conn.; George H. Day and Col. Geo. Pope, also representing the Board of Trade of Hartford, Conn.; Judge S. O. Griswold, Connecticut.

Chauncey B. Ripley, of New Jersey, called the convention to order and introduced Gov. Levi K. Fuller, of Vermont, as temporary chairman. Gov. Fuller in turn introduced Gen. Roy Stone, who addressed the convention at length. He said in substance: "Columbus discovered America in vain, if after 400 years we are still behind the ancient Peruvians and not ashamed of it. These people, not yet emerged from barbarism, with no written language and no means of record or communication better than a knotted string, possessed a system of roads which astonished their Spanish conquerors more than all the other wonders of that marvelous land.

"And what lessons we might learn from these barbarians! They worked without iron or steel, steam or gunpowder, animal power or wheel carriages, and without knowing the principles of the arch or the uses of cement they wrought wonders in rock excavation, embankment and masonry.

"It is for you of the great west; or, rather, as we may say from to day, you of the great center and heart of the country, to lead the notion in road reform. Your needs are the greater, though ours are great enough, and you have aroused yourselves, while most of us are yet asleep. If you lead in forming a national union of the friends of good roads you will find a hearty following all over the land.

"Within the last year, through the special reports of our consuls abroad, many people have discovered that all over the world the common roads are among the prime concerns of national government, alike under monarchies and republics, and they are asking the pertinent question: 'Why can not the government of the "Great Republic" do what all other governments are doing for the people's benefit?'

"For good roads we should be able to unite 3,000,000 or 4,000,000 votes. The farmer and his family suffer most of the miseries of bad roads, but the pecuniary loss is fully shared by the people in towns and cities, and the remedy should not be disproportionately at the farmer's cost.

"At the Missouri convention it was said that "the investigation made by our State department abroad and the wide discussion of the subject at home have, however, at least made it clear that this is the only civilized country in the world without good roads, and that the want of such roads is not only a grievous tax upon the whole people, but the greatest hindrance to their progress, intellectual, social, moral and political. In default of an official inquiry, we can only guess at the money value of this tax, at the extent of roads needed to give relief, and at the expense involved; but it is needful to make some estimate of these in order that we may determine whether relief is possible, and, if so, where we are to look for the means and what authority should control the work.

"Data for such an estimate are scarce and uncertain; but in the state of Illinois the money loss by bad roads to farmers alone is estimated on good authority at $16,000,000 per annum. This, of course, is not the whole tax, since the people in towns bear their full share in loss of trade and increased cost of living, but it will be a safe basis of calculation, and at this rate the total loss for the United States would approximate $300,000,000 per annum. The average earnings of capital in this country may be taken as 3 per cent., at which rate this $300,000,000 is the interest on $10,000,000,000, or one sixth of the entire wealth of the country."

The permanent organization was effected, at the conclusion of Gen. Stone's address, by the election of Judge E. H. Thayer, of Clinton, Iowa, as president, and S. T. K. Prime, of Illinois, as secretary. A committee on organization subsequently elected the following officers:

President, Senator Manderson, of Nebraska; vice-president, Gen. Roy Stone, of New York; treasurer, William H. Rhawn, of Pennsylvania; executive committee, Judge Thayer, P. D. Armour; Leland Stanford, S. W. Allerton, Chauncey B. Ripley, A. J. Cassett, Seward Webb, Charles L. Burdett.

The object of the organization is stated to be "to awaken general interest in the improvement of public roads, determine the best methods of building and maintaining them, secure the legislation, state or national, that may be necessary for their establishment and support, and to conduct or foster such publication as may serve these purposes."

CALL FOR A ROAD CONGRESS IN INDIANA.

THE Commercial Club, of Indianapolis, which made a conspicuous success of the Paving Exposition which was held under its auspices in 1890, has started a movement for a better road system in Indiana, and has put a committee in charge of it composed of William Fortune, chairman; Hon. Claude Matthews, Governor-elect A. W. Conduitt, Evans Woollen, D. M. Parry, E. B. Porter, Louis H. Gibson, W. B. Roberts, and Charles F. Robbins. The committee announces its plan of procedure as follows:

"For the purpose of bringing together interested representatives of all parts of the state to take steps toward establishing a better system of road making in Indiana, the Commercial Club, of Indianapolis, authorizes the issuance of a call for a Road Congress, to be held in this city, Dec. 6th, 7th and 8th, 1892.

"The Congress will consider methods of work, suitability of materials, faults of the present system, needed legislation and the various practical questions involved in the road making problem, in addition to which the important benefits, commercially and socially, to be derived from good roads and streets will receive attention.

"The programme will embrace addresses from people of national prominence as authorities on the subjects to be considered, and opportunity will be given for such discussion as will fully enlighten those desiring information.

"The object of the Congress will be to stimulate appreciation of the importance of good roads, and to make an organized effort to give Indiana the best road system in the country, which will, it is believed, more effectually than anything else that needs to be done at this time, increase its prosperity, promote its general improvement, and advance it in the good opinion of people everywhere.

"The Congress will be composed of delegates to be appointed by boards of county commissioners, municipal governments, commercial organizations, agricultural societies and institutions, and such persons as may be formally invited to be present by the committee in charge. Township trustees will be entitled to participate in the proceedings. Delegates will be expected to present credentials."

The Congress will convene in the House of Representatives, State Capitol (the use of which for its sessions has been specially granted), on Tuesday, December 6th, at 10 o'clock A. M. The programme for the sessions will be published later.

Governor Chase has written the following letter endorsing the movement:

EXECUTIVE DEPARTMENT,
INDIANAPOLIS, IND., October 15, 1892.

William Fortune, Esq., Chairman of the Committee on Indiana Road Congress:

DEAR SIR—It gives me pleasure to heartily endorse the Indiana Road Congress to be convened in this city in December. In my opinion no subject so nearly and materially concerns all the people of our state as good roads. I shall favor any plan or means for the betterment of our public highways, as I am sure in this way our state will be benefited and the welfare of our people augmented. I sincerely hope that county and municipal governments will earnestly render the cause every assistance possible, and that the Congress may be attended by representative men from every locality in the state. Yours truly, IRA J. CHASE.

The indications are that the Congress will be attended by several hundred delegates and that it will be a highly successful meeting.

STREET SUBWAYS FOR PIPES AND WIRES AT NOTTINGHAM, ENGLAND.*

By A. Brown.

IT has been said that if the human skin were transparent none of us would dare to move a limb; we should be afraid to touch or disturb in any way that wonderful and delicate organism which would be exposed to our view. It appears that the time is fast approaching when our busy streets and main thoroughfares in large towns would fill us with just as much awe if the surface were transparent and we could see what there is beneath that surface. There are now the main sewers, gas and water pipes, with their numerous branches, telegraph and telephone wires, and in the larger and more important of the towns, pipes for carrying hydraulic power or compressed air, pipes and conduits for electric light cables, conduits for cables for cable tramways or for electric tramways; and if the lead of our American friends is followed, we shall have to add another pipe for carrying steam for power and for heating purposes. There is, therefore, beneath the surface what may be compared to a living organism, which is daily growing in complexity.

Considerable difficulty is experienced in dealing with this complex system; the surface of the roads is cut into, almost over its whole surface, for the purpose of laying and replacing from time to time the various pipes referred to, and the borough engineer is expected to maintain the surface in a good condition after the operations of various people who disturb the paving, and who have very little interest in relaying or maintaining it satisfactorily. It does seem to be somewhat of a blot on our boasted civilization that when a pipe has to be taken up, in a busy and crowded thoroughfare, the system usually adopted is to tear open the street, whatever may be the class of pavement, lay in the pipes, and then "make good" the surface. Those two little words—make good—cover a lot of ground, but are somewhat misleading; it is as much an engineering impossibility to immediately restore the paving over a newly filled up trench to its original condition as it is a physical impossibity to heal a serious wound on a human body without leaving a scar.

The streets may be compared to a human body continually undergoing surgical operations; not only should the damage to the surface of the streets be taken into account by this condition of things, but consideration should be given to the hindrance to vehicular traffic when the streets are "up," and also to the pecuniary loss to tradespeople in the street. The only remedy for this is for large towns to lay down, where possible, subways in the principal streets and crowded thoroughfares, and especially in the case where new streets are made in connection with public improvement schemes.

The first subways constructed in this country were in London, about the years 1860 62, and the first subway outside the metropolis was constructed in Nottingham in the years 1861-62 in Victoria street and Queen street; these were followed a year or two later by subways in Lister Gate and Market street, and in the year 1886 the author designed and carried out subways in Albert street and Wheeler Gate.

To show the value of such works, in the street called Victoria street, in which is situated the General Postoffice, there are besides the gas and water pipes and connections, no less than six pipes containing telegraph wires in this subway, and not one single stone was disturbed in this carriageway for 25 years, and in that period not one single penny was spent on repairs in this street.

The author proposes to describe to you some subways which are now being constructed under his direction, on what is known as the condemned area. This site, which has an area of about 12,500 square yards, was declared an unhealthy area, and was purchased under the Artisans and Laborers Dwelling Act, 1875; it was covered with a wretched and disreputable class of property, and was very much overcrowded. The subway proper is ten feet wide and eight feet six inches high, with semi-circular arch, and is ventilated by means of gratings at the surface level of street about forty-eight feet apart, also by three side entrances and by open grating in refuge at lower end of sixty-foot street. The sideways, which form the means of communication between the subway and the vaults, are placed ordinarily about forty feet center and center, and are four feet high and three feet wide. The sewer is constructed under the floor of the subway, and is a fifteen-inch earthenware pipe, with Hassall's patent single-lined joint. Under the causeways on each side of the street vaults are constructed, which are each eight feet six inches wide by nine feet three inches long, and about seven feet high; these vaults are rented by the purchasers of the building lots adjoining. The floor of the subway is laid with cement concrete brought to a smooth surface, and the floors of sideways and vaults are laid with bricks. Along and under each sideway is laid a nine-inch pipe with a Buchan's disconnecting trap and air inlet, and beyond is a right and left-hand junction for receiving the drainage from the properties. In the subway are fixed brackets, upon which may be placed pipes containing telegraph and telephone cables, the gas, water, and any other pipes being laid on the floor of the subway, or on iron standards fixed on the floor of the subway. At convenient distances hydrant chambers are built over certain of the sideways, in which are placed the fire hydrants and valves. By this method of construction access can be obtained to and any alterations and additions made to sewers, gas, water, and other pipes, and the house connections therewith; the fire hydrants and valves can be examined, repaired and renewed, without taking up or disturbing one single stone in the surface of the street The life of the iron pipes and connections in the subway is practically everlasting, as there is no rust, and the expense of relaying mains and especeially gas services through this cause is saved.

The author has heard that there is considerable doubt in the minds of some engineers as to the possible effects of a very severe frost on the water pipes in the subway. During the somewhat severe frost in the early part of this year, the maximum, minimum, and ten o'clock A. M. temperatures inside the Albert-street subway were taken, and the similar and corresponding readings were taken outside the subway.

The lowest reading in the open air at the water offices, outside the subway, was 19.2° on February 19, and the lowest readings in the subway, 40.7°, and 41.0° January 16, 17, and February 19; the highest reading outside the subway was 53.4° on February 7, and the highest reading on that day in the subway was 45.8°, so that for a range of temperature outside of 34.2°, there was only a range of temperature of say 5° inside the subway, so that there is not the least chance, even with the present rigorous English winters, of the thermometers in the subways going down to anywhere near freezing point. The minimum temperature at the observatory at the Nottingham Castle, on Feburary 19, was as 13.0°, showing what the temperature was outside the town.

As regards the cost of the subway, this is of course rather heavy; the cost of the subway proper, including side entrances, sideways, and every appurtenant to the subway itself, is about $16.16 per lineal foot, or $88,000 per mile. This does not include the cost of the sewer, as this would be common to any method of forming streets

*From a paper read before the Association of Municipal and County Engineers, of Nottingham, England.

with or without subways, nor does it include the cost of the concrete foundation for roadway. The vaults under the causeways cost about $97 each, and there being vaults under each causeway they cost, therefore, about $58.20 per running yard of the street; these vaults are let on a rental of $4.85 each per annum, or five per cent. on the outlay. The subways proper cost about $14,550; three and one-half per cent. interest on $14,550 is $509.25, but the profit on the vaults is one and one-half per cent., as the money is borrowed at three and one-half per cent. and five per cent. is charged, and this equals say, $218.25, so that it resolves itself into this question, is it worth $291.00 per annum to have subways in the two new streets referred to? The author thinks there can be only one answer to this question, and that must be in the affirmative. He does not urge that town councils should incur immediately a large expenditure of money on laying down subways in all existing streets; this would be impossible from its cost, but that in the case of new main streets and where the main thoroughfares are improved and widened, that the opportunity should be seized to lay down subways, in order to minimize as much as possible the evils resulting from the continuous taking up and relaying of streets.

PROPOSED ESTABLISHMENT OF A FEDERAL ROAD DEPARTMENT.

COL. ALBERT A. POPE, a leader of the movement for better roads, who has been for years a persistent worker in the cause, is now engaged in circulating the following petition among college presidents, railroad presidents, postmasters and others, with the request that they sign it and aid in getting others to sign it:

"*To the Honorable Senate and House of Representatives in Congress assembled:*

"We, the undersigned, citizens of the United States, hereby most respectfully petition that there be founded in the city of Washington, in the District of Columbia, a Road Department, similar to the Agricultural Department, for the purpose of promoting knowledge in the art of constructing and maintaining roads; and we ask that in such department provision be made for teaching students so that they may become skilled road engineers.

"In connection with this Road Department we request that there be established a permanent exhibit in which shall be shown sections of roads illustrating various methods of construction and also the best road materials and machinery.

"We further petition that Congress appropriate funds sufficient to erect a building at the World's Columbian Exposition for the purpose of a comprehensive road exhibit."

The success of this movement will undoubtedly do much to advance the improvement of highways, which is of such great importance to the country, and it is to be hoped that it will receive deserved encouragement everywhere.

TEST LOADS FOR BRIDGES.

QUITE a lively little controversy has been going on for several weeks past in some of the German technical journals on the value of test loads for bridges, a matter which, at various times, has been discussed at such length that it might well have been considered as disposed of definitely and finally. The immediate cause of its revival appears to have been given by the results of a recent examination, by a railroad company, of one of the iron bridges on its line, the examination having revealed the existence of a very considerable degree of local corrosion. Test loading of the bridge, just before and again just after this discovery was made, showed only a moderate degree of deflection, well within what was considered a permissible limit, and the company accordingly took the stand that the safety of the bridge was practically unimpaired, and that the structure might be continued in use without re-inforcement or repairs. Thereupon the *Centralblatt de Bauverwaltung* took up the matter, criticisingthe conclusions of the company, and giving emphasis to the fact that while unduly great deflection of a structure under a test load unquestionably demonstrates weakness, moderate deflection is no guarantee whatever of safety. The way having thus been paved for further discussion, several correspondents were not slow to avail themselves of it and a bombardment with letters *pro* and *con*, therefore, merrily proceeded. After all, however, the fact remains that the position taken by our German contemporary is substantially correct, and by far the larger number of bridge engineers, both here and abroad, will readily agree to it. Test loading of a bridge really seems to be but a strangely surviving relic of the usual opening ceremonies, and with the development of the science of bridge building, has gradually lost all significance as a measure of safety. The reason why it has been retained may be found largely in the fact that, in general, it lends impressiveness to the ceremonies which usually accompany the completion of a bridge or its surrender to traffic, and, further, that the public wants some occular demonstration of a structure's sustaining power before putting any trust in it. To the engineer, however, the application of a test load tells nothing, that his strain sheets have not already told him. It is strange only that there are still some practicing engineers who will not admit this.—*The Mechanical News.*

OBJECTIONS TO THE USE OF GAS TAR IN ASPHALT PAVEMENT FOUNDATIONS.

To the Editor of Paving and Municipal Engineering:

SIR—I see in a New York specification that a layer of gas tar should be put on a Portland cement foundation before laying the hot natural asphalt powder thereon, and ramming down same to make a compressed asphalt roadway.

This is a mistake. First—It is like a fifth wheel to a coach, of no earthly use. Second—In the hot summer weather the gas oils would be aspirated through the asphalt by the sun's rays and spoil the surface. Again, it says that when a natural asphalt roadway has been rammed and rolled before giving it up to the public, it should be sprinkled with coarse grit.

This is another mistake. It would just spoil the surface. The grit would get incrusted in the asphalt; only fine cement should be used for sprinkling. After a few days under traffic the asphalt gets hard and then grit will not damage it, but will do it no good.

Paris, October 28, 1892. W. H. DELANO.

OFFERS OF STREET RAILWAY COMPANIES FOR MUNICIPAL FRANCHISES.

THE various cable and electric street railway companies of Seattle have united in a petition to the city council for an extension of their franchises for twenty-five years, the franchises now having an average of twenty years yet to run. They offer in return for this concession to pay to the city a percentage of their earnings, beginning ten years from the present time. For the first five years they offer to pay one per cent., estimated to amount to $100 per day; for the next five years, one and one-half per cent., estimated to produce $237.50 per day; and for the remaining fifteen years, two per cent., estimated to produce $400 per day. As a reason for making this offer, the companies state that, owing to the terms of their present franchises, they have been able to sell only a part of their bonds, and that, in consequence, a large amount of capital is locked up which might, under better conditions, be released for other investment in the city.

ADVICE REGARDING ROAD-MAKING.

WILLIAM M. P. BOWEN and Issac H. Southwick, Jr., of the Committee on Highways, League of American Wheelmen, have addressed to the people of Rhode Island an appeal for co-operation in a movement for better roads in that state, in which they urge the use of wide tires on wheels, steam road rollers and stone crushers in the making of better roads. They also advise the use of vitrified brick and sheet asphalt, saying that "something harder than macadam is needed." Inspection of the roads under a state commissioner is also urged.

PAVING BRICK TO BE MADE IN STREATOR, ILL.

THE people of Streator, Ill., have for some time been trying to induce capitalists to engage in the manufacture of paving brick in that city with the result that Messrs. P. F. and C. C. Barr, and J. F. Anderson, of New York, and W. Beechem, of Pittsburg, have about decided to locate there for that purpose. They have secured an option on eighty acres of land believed to be suitable, and are now having the clays tested.

STORAGE BATTERY CARS IN NEW YORK.

TEN cars to be propelled by electric storage batteries are now being built for the Second avenue line in New York City. This system adopted is radically different from others. In an experiment made with this class of car at Chester, Pa., during the winter of 1891–'92, the car ran 5,000 miles.

The cars will be of regulation style, 16-ft. bodies, palace finish and of complete appointment. They are to be lighted by an auxiliary set of batteries so the light will be independent of grades and variations of speed. The batteries are to be disposed under the seats and contained in two long trays. They will be removed from the ends and not from the sides. Each car will be equipped with two motors; either will be of sufficient power to handle the car under ordinary conditions. This large amount of motor power will be for emergencies and for heavy traffic as well as for towing an additional car. The motors will be the hollow Grammering type. It is claimed that this system of accumulators has surmounted many of the difficulties of the storage battery system.

MUNICIPAL OWNERSHIP OF STREET RAILWAYS IN ENGLAND.

THE street railways of several cities in Great Britain have been acquired by the municipal authorities, a course recommended by a committee of the House of Lords in 1879, though the committee did not think that the lines should be worked by the authorities. The corporation of Manchester owns twenty-six miles of street railway; Birmingham, nineteen; Liverpool, twenty-eight; Glasgow, thirty; Newcastle, eleven; Bradford, fourteen miles. Altogether about 243 miles of street railway are owned by different local authorities in the United Kingdom.

A TEXT-BOOK ON HIGHWAY CONSTRUCTION.

"A TREATISE on Highway Construction," by Mr. Austin T. Byrne, C. E., is a valuable contribution to the limited literature on the subject. It is intended as a text-book and work of reference for those who may be engaged in locating, construction or maintenance of roads, streets and pavements. It comprises 723 pages and is published by John Wiley & Sons, New York. Price, $5.00.

A RECENT LEGAL DECISION.

Assessment for Local Improvements not Unconstitutional.—The power to make assessment for local improvements in cities and towns is not an infringement upon the constitution rule requiring all taxes to be uniform. And assessments for local improvements upon the basis of frontage, where the lots abutting upon the improvement are of substantial equal depth, will be upheld where the same is not shown to be unfair. *City of Denver* v. *Knowles*, Sup. Ct. of Col., 30 Pac. Rep. 1041.

PHILADELPHIA STREET CLEANING SYSTEM.

CHIEF MARTIN'S report shows that the expenditure for street cleaning in Philadelphia in 1891 amounted to $559,728. Of this sum $9,220 was paid in salaries to the officials; $2,400 for the keeping of horses and wagons for the chief and five inspectors; $300 for printing, stationery and incidentals; $547,808 for cleaning streets, removing ashes and garbage.

The total area cleaned during the year was 709,375 squares, measuring about 500 feet in length by an average of 26 feet in width.

Thus a square contains about 13,000 square feet and the total area cleaned in square feet was 9,222,875,000. In addition, 240,546 sewer inlets were cleaned; 36,153 crossings, in January to April, inclusive; 1,840 markets; and snow from 54 fire plugs. These figures, of course, are stated in terms of one cleaning.

The loads of refuse removed during the year were 290,680 of dirt; 573,999 of ashes; 84,065 of garbage; total, 948,744 loads. In addition, 14,795 dead animals were removed.

The work of the department was done by five contractors, each having a separate district, and using street cleaning machines. These contractors bid $89,000 extra on the basis of burning the garbage, they to erect furnaces, but their bids for this service were not accepted. One firm, however, bid $12,000 per district for burning the garbage, or $60,000 for the whole city.

Frequency of cleaning varied from machine sweeping daily with a day broom patrol in addition to only once a month. All sewer inlets were cleaned at least twice a week, where the streets were cleaned that often, and all others once a week. All public market houses were swept once a day, and when the thermometer was above the freezing point they were scrubbed with water at least twice each week.

PERSONAL.

Mr. Ernest E. Cook has been appointed city engineer of Council Bluffs, Iowa.

C. H. Rust has been appointed as deputy city engineer of Toronto, Canada. Mr. Rust was formerly assistant engineer in charge of sewers.

Mr. Ira S. Schrop, superintendent of water-works at South Bend, Ind., has resigned and John Graham has been elected to succeed him.

W. C. Tulham, Esq., has been appointed assistant city engineer of New Orleans, La., under Mr. Brown, city engineer.

Mr. Joseph E. Dore has been appointed sanitary engineer at Montreal, Que.

Mr. Thomas E. Mitchell has been appointed to fill the place of street superintendent and assistant to the city engineer at Mobile, Ala. Mr. Mitchell is a graduate from the State University at Tuskaloosa, in the class of civil engineering and has had some two years practical experience in his profession.

A FRENCH ASPHALT COMPANY'S EXHIBIT AT THE WORLD'S FAIR.

COMPAGNIE GENERALE DES ASPHALTES DE FRANCE,
QUAI DE VALMY, 117 AND 119.

PARIS, October 28, 1892.

To the Editor of Paving and Municipal Engineering:

I have only received this day your issue of October containing Monsieur Malo's article on Asphalte Nomenclature, translated by me, and notice a few mis-prints thus: Page 120, fourth line, "alliteration," should be "attrition;" fifth line, "mineral," should be "mined;" and fourth line from bottom, "call," should be "take."

My company has obtained about 1,000 square feet in the French mines section at the Chicago World's Fair, and will exhibit not only asphalt ore from its various mines and pure mineral bitumen extracted therefrom, but also a complete series of all the applications of asphalt in road making, sidewalk making, civil and military engineering, architectural and building trade uses, etc., etc.

In this city the tendency is to asphalt the narrow streets, court yards and blind-alleys (impasses) of the center from hygienic motives.

Choleraic germs can not house in an anti-porous material like asphalt.

W. H. DELANO.

Improvement and Contracting News.

PAVING.

Ridge avenue, Zanesville, Ohio, is being paved.

Main street, Quincy, Ill., will be paved with brick.

Meriden, Ct., will spend $30,000 on her streets next year.

Kokomo, Ind., will lay brick sidewalks in several streets.

The Brady street paving at Davenport, Iowa, is completed.

Fremont, Neb., will let the contract for more street paving.

Paving bonds for $71,000 have been sold at Davenport, Iowa.

Considerable brick street paving will be done at Goshen, Ind.

Maiden Lane, Albany, N. Y., will be paved with granite blocks.

The pavement on North Seventh street, Terre Haute, Ind., is completed.

All the streets of the borough of Jenkintown, Pa., will be macadamized.

Richmond, Ind., has expended $600,000 this year on street improvements.

Menominee, Wis., is to have another brick-yard to cost about $100,000.

Third, Adams and Washington streets, Troy, N. Y., are to be paved with brick.

North Buckeye street, at Wooster, Ohio, is being paved by Landers Bros. & Betson.

John S. Key will superintend the work of paving Patton avenue at Asheville, N. C.

Carlinville, Ill., appropriated $50,000 for sewerage, street paving and granitoid sidewalks.

The proposed paving of Ashman street, New Haven, Conn., is estimated to cost $23,500.

The council of Belle Centre, Ohio, is busy putting down Berea stone and cement sidewalks.

The citizens of the villge of Alfred Center, N. Y., are preparing to macadamize the streets.

East Bancroft street, from Lagrange to Elm streets, at Toledo, O., is being paved with brick.

A brick pavement will be laid on Olive street, from Sixth to Tenth streets, at St. Joseph, Mo.

Brockman & Son were the lowest bidders on the Main street improvement at Fremont, Ohio.

South Adams street, Peoria, Ill., is being paved with brick by the Rockford Construction Company.

Bids will be received until Nov. 21, at Fremont, Ohio, for the improvement of Morrison street.

Extensive improvements are being made on the streets at Coatesville, Pa. Beaumont Bros. have the contract.

The council of Alexandria, Va., has taken initiatory steps toward creating a street improvement fund.

Tenth street, between Topeka avenue and Tyler street, at Topeka, Kan., will be paved with vitrified brick.

Columbus, O., has, perhaps, more miles of streets paved with vitrified brick than any city in the United States.

The paving of Pratt street with vitrified brick, at Hartford, Conn., has been completed and opened to the public.

The reported total cost of the proposed work for the extension of Potrero avenue at San Francisco, Cal., is $241 203.

Six streets at Omaha, Neb., will be paved with asphalt, granite, sandstone, or brick, for which bids have been received.

The city engineer of Sedalia, Mo., has been directed to prepare estimates for the paving of Third street with asphalt.

A handsome concrete pavement has been laid around the court-house at Clearfield, Pa. It contains about 9,000 square feet.

R. M. McCray was awarded the contract to improve Morris street from Lee street to Belmont avenue in West Indianapolis, Ind.

South First street and South Fifth avenue, Maywood, Ill., will be improved by curbing on either side and cedar block paving.

Sloan & McIlwain were awarded the contract for paving Iten street, Allegheny, Pa., with Ligonier blocks, in consideration of $39,725.

Oil City, Pa., now has 33,000 square yards of brick paving. Center street, from Seneca street to the Center street bridge, is completed.

Lean & Christy were awarded the contract for grading Scranton avenue from Ritchie to Twenty-fourth street, at Superior, Wis.

Redlands, Cal., is paving State street with brick. The work, however, is progressing very slowly on account of a scarcity of brick.

The borough of Wilmerding, Pa., proposes to spend about $60,000 in paving. It is probable that no work will be done before spring.

The contract for improving Eighth street around the viaduct at Cincinnati, Ohio, has been awarded to Henkle & Sullivan, at $40,718.

It has been ordered by the board of public works of Indianapolis, Ind., that Missouri, Merrill and McCarty streets be paved with brick.

M. C. Burke was awarded a $4,226.20 contract for grading Elmira avenue between Belknap and Twenty-eighth streets, at Superior, Wis.

Vitrified brick for roadway purposes will be tried at Eau Claire, Wis., and proposals will be issued for paving four of its streets with brick.

The following estimates made and recommended by the board of road commissioners of Waterbury, Conn., for the expenses of that department in 1893: Repairs and maintenance of streets, $18,000; new work, $15,000; block paving, $10,000, and macadamizing, $10,000.

The work of paving the streets of La Salle, Ill., is going on briskly, and before snow flies the contractor expects to have five streets completed.

It has been proposed to annex Baltimore and Washington by constructing between the two cities a boulevard and an electric railroad 40 miles long.

The Garrison brick will be used at Houston, Texas, the difficulty about the rejection of the vitrified brick for paving purposes being settled.

Knoxville, Tenn., is agitating the question of street paving, but the time for beginning or the material to be used has not been decided upon.

James McDermott was awarded the contract for paving Ottawa street with cedar blocks on concrete foundation from Lyon to Pearl streets at Grand Rapids, Mich.

Swanton, Vt., wants a state appropriation for highways, and there is but little doubt that her request will be granted. It will take $18,000 to put the highways in good condition.

The board of public works of Cleveland, Ohio, will receive bids until Nov. 23d for about 18,400 square yards of wood paving on the iron portions of the Central and Pearl street viaduct.

Adam Weikel & Co. will improve Adams avenue, Evansville, Ind., from Parrott to Garvin streets. The plans and specifications call for a thirty-foot street with brick on a concrete foundation.

The Buffalo Paving Company has been awarded the contract for paving Tryon Place at $31,000, and Puener avenue is to be paved with German Rock asphalt, at a cost of $19,000, at Buffalo, N. Y.

Madison, Wis., is to be congratulated upon the excellent condition its streets are gradually assuming. Throughout the city all the more important streets and drives have or are being macadamized.

W. A. Cain, of Dayton, Ohio, was awarded the contract for the $25,000 improvement on the Middletown and Madison road, for which the county commissioners adopted Hallwood block with tar filling.

At Milwaukee, Wis., Story street, from the C. & N. W. railroad to the north line of Seventh street; also Eighth street, from the east line of Arden to the west line of Runyan, will be paved with vitrified brick.

At Norwood, Ohio, Linden street, from Harris to Highland avenue, will be improved by grading and macadamizing the roadbed, curbing and flagging gutters and constructing the necessary culverts, drains, etc.

The matter of constructing a driving boulevard east of the city of Troy, N. Y., is being agitated by a number of citizens who recognize that the construction of such a project would be a decided benefit to many.

The council of Rock Island, Ill., accepted the paving on Third avenue, from Ninth street to Fourteenth street; on Nineteenth street, from First to third avenues, and Commercial alley. The total amount of the work is $63.690.54, and was done by the Rockford Construction Company.

The board of public works of Denver, Col., allowed the final paving estimates as follows: Champa street, $7,741.43; Arapahoe street, $3,434.80; Stout street, $6,148.96; California street, $7,954.16; Welton street, 6,350.79.

The experiment of paving one of the streets of Washington, D. C., with brick having proved to be such a success, the district commissioners will issue proposals for paving two or more of the principal business streets.

Hanover avenue, Oakland, Cal., will be macadamized with class "C" macadam, from the eastern line of Lake Shore avenue to the western line of Newton avenue. The gutters will also be constructed of broken rock.

The bitumenizing of Park street, Alameda, Cal., is to be made complete throughout. Petitions are being signed by the property holders to have the work extended to the canal on the north side and the bay on the south.

The board of public works of Omaha, Neb., has ordered permanent sidewalks laid of brick, stone and artificial stone, amounting to about 10,000 square feet. It has also approved about $75,000 worth of estimates for public works.

Grand avenue, Milwaukee, Wis., will be paved from the alley between Fourth and Fifth streets to Eighth street, by Henry Vogt. He will receive $1.07 per square yard for cedar blocks and 67 cents per lineal foot for the stone curbing.

The necessary papers for the organization of the American Road Improvement Company have been filed at Albany, N. Y. The object of the corporation is the construction of permanent and substantial roads. The capital is $300,000.

The city council of St. Charles, Mo., has passed an ordinance for the grading and macadamizing of Monroe street, from Main to the city limits. This improvement will cost about $6,000, and will open up some of the best parts of the town.

Curtis & Hinkle have been awarded the contract to improve Washington avenue from Front street to Sater street, and Sater street from Central avenue to Jackson street, at Greenville, Ohio. They are under bond to complete the work by December 15th.

Alderman Charlton, of Savannah, Ga., is condemning what property he wants for opening and extending suburban streets, and will let the price be settled by arbitration. Before the year is gone he expects to have several of the streets opened and in use.

The following bids were received for paving Hawley street, Syracuse, N. Y., between Howard and Townsend streets with asphalt: D. S. Howe, $22,296; J. M. Mack & Co., $24,557; W. H. Gallup, $24,380; Warren-Scharf Asphalt Paving Company, $26,032.

The following contracts for street work have been let at Westchester, N. Y.: Regulating, grading, etc., East 132d street, between Locust and Brook avenues, Peter Handibode, Jr., $18.345; paving with trap block, East 156th street, between Third and St. Ann's avenues, Thomas Harrington, $5,371.86; paving with trap block, Rose street, between Third and Berger avenues, Genovese & Towle, $1,162.82.

Denison, Tex., is agitating the street paving question. Two resolutions have been passed by the council, one for the paving of Austin avenue, between Main and Chestnut streets, the other for paving Main street, between Mirrick and Barrett avenues.

There will be no less than ten miles of macadam road built in Middlesex county, N. Y., before the first of December, at a cost of $60,000. Two-thirds of the expense will be paid by the county tax-payers and the state and property-owners the remaining third.

Parts of five streets and alleys, at Dubuque, Iowa, will be graded, guttered, curbed and macadamized this fall. They are Broad, Dodge, Twenty-fourth, alley between Providence and Lincoln, Garfield and Rhomberg avenues and alley east of Wilson avenue.

The paving of East Fourth street, St. Paul, Minn., with cedar blocks on a concrete foundation is completed. It is one of the most important pieces of work undertaken by the city this year, and there is probably heavier travel over this street than any other in the city.

One of the chief prides of Springfield, Ohio, is her excellent streets. When this season's work is done she will be the proud possessor of four and three-fourths miles of stone block and brick paving, while the board of public works has already passed resolutions declaring it the board's intention to pave certain streets next season.

The board of public works at Salt Lake City, Utah, awarded the contract for the Main, First and Second South street paving to the Culmer-Jennings Paving Company. The board came to the decision that sandstone curbing and sandstone blocks should be used, also refined asphalt. The asphalt to be used is a Utah product, and as yet practically untried. The total amount of the contract is $134,400.

The mayor of Boston, Mass., has signed ordinances providing for the widening of Water, Howard and Norfolk streets. It is proposed to widen Washington street for a considerable distance. The finance committee has been instructed to provide $20,000 for the paving of East Sixth street, between K and O streets; $50,000 for regrading Congress street, between A and L street bridge; $30,000 for paving East Eighth street, between Old Harbor and K streets, and $50,000 for the construction of Talbot avenue in Ward 24.

SEWERS.

A sewerage system is being built at Laredo, Texas.

Work on the sewer system at Cicero, Ill., is progressing finely.

Bids will soon be asked for sewers in several streets at Ogden, Utah.

Southbridge, Mass., voted to borrow $11,000 for sewer construction.

A sewer system will be built in East Broadway, Monmouth, Ill.

Thomas Floyd received a $9,800 sewer contract at Winthrop, Mass.

A system of sewers will be laid on Lindsay street, Gainesville, Texas.

Coleman, Dunspaugh & Perry have been awarded the contract for the completion of the sewers in Hornellsville, N. Y.

Reading, Pa., has adopted a house sewerage system that will cost $125,000.

About $30,000 worth of sewers will be put in this fall at Ishpeming, Mich.

Plans and estimates have been made for a sewerage system at Ballard, Wash.

The council of Pittsburgh, Pa., has voted in favor of several additional sewers.

Redwood City, Cal., has voted to issue bonds for $35,000 for a sewer system.

The council of Pottsville, Pa., has voted to construct several additional sewers.

The construction of the Columbia street sewer at Burlington, Ia., has been begun.

Ironton, Ohio, is talking of spending over $100,000 to establish a sewer system.

The city engineer at Selma, Ala., is investigating the subject of a sewerage system.

Ilion, N. Y., has established a new system of sewerage and will put in eleven miles of pipe.

The lowest bid for the Downing avenue sewer at Denver, Col., was that of J. B. Hendry.

R. R. Smith was awarded the contract for a sewer on West Ninth street, at Astoria, Ore.

At St. Joseph, Mo., sewers will be built in portions of sewer districts Nos. 16 and 25 this fall.

A pipe sewer will be built on Liberty street, from Monument avenue to the levee at Dayton, O.

Bonds will soon be issued for $60,000 for the construction of sewers in District No. 2, Findlay, O.

Work has been commenced on the big sewer at the foot of East Alder street, Portland, Oregon.

It is reported that plans are being prepared for a sewerage system to cost $50,000 at Corvallis, Ore.

The town board is considering the advisability of putting in a system of sewers at Iron River, Wis.

About $12,000 will be expended in sewers at Wilmerding, Pa. The work may perhaps be done this fall.

Proposals will be received until Nov. 22d at Seward, Neb., for the construction of 5,395 feet of sewers.

Thomas McKean was awarded the contract for the Norfolk avenue sewer at Buffalo, N. Y., for $84,047.

An additional $200,000 has been appropriated for the construction of lateral sewers at Providence, R. I.

A sum not exceeding $20,000 has been voted by the city council for sewer extensions at Concord, N. H.

It has been voted by the town council to construct sewers at a cost of $13,000 at Winthrop Highlands, Mass.

D. B. Lacy, of Anniston, Ala., has a new contract to put in a sewer one and one-half miles long, at Cedartown, Ga.

John W. Hill, of Cincinnati, has submitted plans and profiles for a general system of sewers in Marietta, Ohio.

The contract for a sewer system at Chautauqua, N. Y., has been awarded to W. J Dunn, of Pittsburg, Pa., at $9,000.

Sewer No. 1, at Fostoria, Ohio, will cost not less than $150,000, and will not be completed until some time next summer.

Estimates have been submitted for sewers in West Denver (Colo.) sewer district No. 2. The cost is placed at $116,250.

The city engineer of Westboro, Me., has been directed by the city council to prepare plans for a complete system of sewerage.

J. G. Kelly has been appointed engineer for the construction of the proposed waterworks and sewerage system at Corvallis, Ore.

Sewer commissioners have been appointed at Haverstraw, N. Y., and will secure estimates for a sewer system for that village.

Morton, Ill., is to have a system of sewers and water-works at a cost of $4,000. One hundred hydrants will be put in for fire purposes.

The joint committee on sewers at Bridgeton, N. J., has recommended that bonds be issued for $100,000 for the construction of a sewerage system.

Nine thousand and forty-nine feet of sewers, extending from the present outlet of the sewerage system of Denison, Texas, to Red river, will be built.

Plans for the proposed sewerage system at Waterloo, N. Y., are nearly ready to be presented to the board of trustees for inspection and consideration.

The village trustees of Whitestone, N. Y., have decided to petition the next legislature for authority to issue bonds for the construction of a sewerage system.

Geo. L. Gillespie secured the Baldwin street and Fort Wood contract for sewerage at Chattanooga, Tenn. H. H. Chandler received the Georgia avenue sewer.

A special election will be held on the 19th of this month at Modesto, Cal., to vote on the issue of bonds for $85,000 for the construction of sewers and water-works.

M. Dunn was the lowest bidder for building a sewer in Eagle avenue, from Westchester ave. to 149th street, at Westchester, N. Y. His bid was for $6,595.45.

The board of aldermen of Charleston, S. C., has adopted the resolutions recommending that $3,000 be appropriated for surveys and plans for a system of sewerage.

Duluth, Minn., is to have two new sewers. One in Third street, between 7th and 10th avenues, to cost $4,377.23, and one through blocks 18, 19, 20, 21 and 22 to cost $3,706.52.

A petition has been circulated at Marinette, Wis., to be presented to the council, asking them to defer the question of bonding the city for sewerage purposes until next spring.

Eldridge & Fogg, of Mt. Vernon, N. Y., have been awarded the contract for constructing the Washington street storm water sewer at Rome, N. Y. The amount of their bid is $7,505.

Springfield, Ohio, has expended, now, more than $150,000 in establishing a system of sewers, affording both drainage for the streets and an outlet for private sewage. More than two miles of sewers have been built this year. It is the policy of the board of public affairs and the council to build sewers before the streets are finally improved.

Thomas Begge & Ward, who secured the contract for constructing a system of sewerage in Spencer, Iowa, at a bid of $17,000, sold their contract to Likes Bros. & Tyndrick, of Des Moines, for $1,900.

The work of placing a system of sewerage in West Newton, Pa., is progressing nicely. The sewer pipes are twenty-four inches in diameter, and at many places they are laid at a depth of three feet.

The recent heavy rains which subjected the drains of Savannah, Ga., to an unusual strain, produced not the slightest damage. Alderman Carson, chairman of the drainage committee of council, reports them to be all right.

The common council of Auburn, N. Y., awarded the contract for the construction of a sewer in Seymour street to D. W. Barnes & Son and contracts for sewers in Grant avenue, Fulton and Evans streets to N. C. Reed.

The report and estimates of the city engineer, of Carthage, N. Y., were accepted by the sewerage commissioners. A complete system is recommended with three outlets into Black River, and the estimated cost is $40,850.

The contract for the completion of the Prior section of the O. K. creek sewer, at Kansas City, Mo., has been awarded to William Taylor at $29,969. The contract for a sewer in district No. 147 was awarded to Cotter, McDonald & Co. at $18,437.

The director of public works at Philadelphia, Pa., estimates that $1,611,500 will be required to construct the sewers absolutely necessary next year. The chairman was instructed to prepare an ordinance to create a loan of $1,000,000 for main sewers.

Several sewer contracts have been let at St. Paul, Minn. The sewer under Frank, Ross and Faquier streets was awarded to Thomas Reilly for $12,972; the University avenue sewer to Patrick Dougherty for $1,991, also the Mongolia street sewer for $943 and the Burr street sewer to John Lindquist for $1,482.

City Engineer George A. Wetherbee, of Malden, Mass., has submitted to the street commissioners of that city a report on a sewerage system in connection with the metropolitan system. The total length of the entire system as proposed will be 339,873 feet, and the total cost $599,059.50 for piping. To this must be added $44,930 25 for a pumping plant at Linden; $53,371.60 for the Linden trunk sewer, and $26,932 for pumping-house expenses, electric motor, etc.

WATER-WORKS.

Water-works are being built at Rapid City, S. D.

Monett, Mo., will soon have a system of water-works.

A water system is being agitated at Floresville, Texas.

Chadron, Neb., has borrowed $10,000 to complete its water-works system.

Investigations for a new water supply are being made at Coatesville, Pa.

Water-works estimated to cost $20,000 are projected for West Point, Ala.

Santa Ana, Cal., has completed a system of water-works costing $60,000, by which the purest artesian water is obtained.

The citizens of LaGrange, Ind., voted favorably on the water-works project.

Elma, Chehalis county, Washington, will build water-works at a cost of $9,000.

The water-works system of Fremont, Mich., is undergoing large extensions.

J. G. Kelly has the contract for constructing water-works at Oakdale, Ore.

Connersville, Ind., recognizes the need of new and more extensive water-works.

By a popular vote, What Cheer, Ia., has decided to invest $50,000 in water-works.

Hepner, Ore., draws its supply from an artesian well, which yields 216,000 gallons a day.

The water-works system at Madison, Wis., is being improved at an outlay of $5,000.

The water-works extensions at Conneaut, Ohio, will require not far from 3,200 tons of pipe.

The council of Janesville, Wis., has ordered the company to lay 8,000 feet of new water mains.

Messrs. Quinn & Kearns will build the water-works at Shenandoah, Pa. Their bid was for $93,080.35.

The Tarboro Water works Company has been incorporated to maintain water-works at Tarboro, N. C.

The citizens of Saltsburg, Pa., will vote some time this month on issuing $12,000 of bonds for water-works.

It is reported that the people of San Luis Obispo, Cal., will vote on issuing $120,000 of bonds to build water-works.

Willoughby, Ohio, is putting in a water-works system and expects to have it finished by the 1st of December.

There is a movement on foot looking towards the establishment of a system of water-works at Athens, Tenn.

The present system of water-works at Woodland, Cal., will be extended at a cost of $28,775 by the Dow Pump Co.

The water-works at Ocean City, N. J., are rapidly nearing completion. They will have a capacity of 50,000 barrels.

The people of Huntington, Tenn., are agitating a proposition to establish water-works for that thrifty little place.

Fairbury, Ill., has borrowed $15,000 to extend its water mains and to connect private dwellings with public mains.

The water board at Melrose, Mass., has been authorized to expend $1,000 in investigations for an additional water supply.

On November 15th the people of Niagara Falls, N. Y., will vote on a proposition to lay new water mains at a cost of $35,000.

Plans are being made at Ballard, Wash., for water-works and a new sewer system. The water-works are estimated to cost $60,000.

Hillsboro, Ohio, is drilling test wells preparatory to constructing water-works. Their first well is flowing 50,000 gallons per day.

The board of street and water commissioners of Jersey City, N. J., has adopted specifications for a contract supply of 35,000,000 gallons of water daily. The contractor will be required to file a bond of $100,000 to furnish a supply of water for 25 years.

Dubuque, Ia., is considering the project of buying the water-works. The company owning them wants between $150,000 and $200,000.

Edinburg, Ill., will have a $27,000 system of water-works. Geo McIntosh, of Bloomington, has been engaged to furnish specifications for same.

Columbia, Mo., will have a water-works system that will be of the best character. Mr. Hiram Phillips, of St. Louis, is doing the engineering work.

The commissioners of water-works of Erie, Pa., have recommended a new water supply to be secured by extending an intake into Lake Erie at a cost of about $270,000.

The committee on water-works estimate that works can be built at Wolfboro Junction, N. H., for $25,000. The matter will be discussed at a meeting to be held December 10th.

The contract for the new water-works at Athens, Ga., was let to Howard Neely, of Chattanooga, Tenn. The works will have a capacity of 3,000,000 gallons per day. The contract price is $118,000.

An ordinance has been passed by the council of Seneca, Kan., granting a 30-year franchise to James N. Burns, Jr., of St. Joseph, Mo., to build and operate a system of water-works in that city.

Bozeman, Mont., has a fine system of water-works. The reservoir is three and one-half miles from the city, and holds 1,500,000 gallons. It is 255 feet above the town and the source is Lyman creek.

The city engineer of El Paso, Texas, has been authorized by the city council to prepare plans and specifications for a system of water-works for that place. The plans are to be for a city of 30,000 inhabitants.

A new system of pumping apparatus and a complete filtering outfit, both of the latest and most approved patterns, are being added to the water-works at Keokuk, Iowa. When the improvements are completed the original plant will form but a small part of the new one. They call for a vast outlay of money but will give to Keokuk the most perfect water-works system in existence.

BRIDGES.

Owosso, Mich., is building a new $800 foot bridge.

Four bridges are being built north of Wakefield, Neb.

A new bridge is being built over Kalamazoo river at New Richmond, Mich.

A project is on foot to build a bridge across the Brasos river at Waco, Texas.

A new bridge is being built across the river on Hillsdale street, at Hillsdale, O.

The C. & O. people will build a new double bridge over the Big Sandy, at Catlettsburg, Ky.

The Chicago Bridge Company will build the iron bridge across the Colorado river at Austin, Tex.

The King county, Wash., commissioners have let a contract for a bridge over White river to cost $2,340.

A large iron bridge has been completed at Bellville, Ohio, which is said to be the finest bridge in the county.

A new bridge will be built over the Black river at La Crosse, Wis., leading to French Island. It will cost $3,337.

A new $4,245 bridge will be built in Cedar street, at Canton, Ohio. The Canton Wrought Iron Bridge Company have the contract.

The contract for building the Burnside street bridge at Portland, Oregon, was awarded to the Bullen Bridge Company at a cost of about $267,000.

Brown & Hathaway were awarded the contract for the center pier and abutments of the Clinton street bridge at Milwaukee, Wis., for $19,700.

Operations have actively commenced on the erection of the mainland bridge at Galveston, Texas. It is thought it will take a year to complete the bridge.

Work on the draw bridge at Alton, Ill., is progressing nicely and the contractor, L. M. Moss, expects to have the bridge ready for the iron work by the 1st of January.

The bids received for the stone and arch bridge at Court street, N. Y., were all above the amount of appropraition and the common council will be asked to increase it to $150,000.

The county commissioners of Vigo county, Ind., have let the contract for erecting seven iron bridges on various roads in the county, to the Pearl Bridge Company, of Benton Harbor, Mich.

Plans and specifications have been completed for the bridge to be built across the Santa Ana river at Yorba, Cal. It will be 360 feet in length, 18 feet wide and eight feet above the river bed.

The reorganized Pacific Short Line Bridge Company has commenced the erection of a $1,000,000 bridge across the Missouri river at Sioux City, Iowa. It will be open to the use of all railroads for toll charges in nine months.

There are thirty bridges on the Mississippi river between St. Louis and St. Paul. Ten of these are high bridges, seventeen are draw bridges, and three are pontoon bridges. The Eads bridge at St. Louis has the largest channel opening, which is 506 feet in length.

A bridge company has been incorporated at Little Rock, Ark., with a capital of $250,000. The avowed purpose of the bridge company is to build, own and maintain a highway bridge across the Arkansas river at Little Rock and to exact toll for the use thereof.

The San Francisco Bridge Company was awarded the contract for building a bridge across the Missouri river between Iron Mountain and Superior, Mont., at a cost of $8,380. The bridge will consist of two spans, each 225 feet long, lapping eleven feet on the banks and the center resting on a tubular iron pier. It will be sixteen feet wide.

The third highest bridge in the world has just been completed at Shumla, Texas, for the Southern Pacific Railroad, which crosses the Pecos river at that point. It is by several feet the highest bridge in the United States. It is 2,180 feet in length and 328 feet above the surface of the stream. It has forty eight spans, nearly all of which are iron plate girders.

Bids will be received until Nov. 21st for building the iron work of the bridge over Grand river at Lansing, Mich.

A wonderful bridge has just been completed across the Wilson river, twenty-nine miles east of Tillamook, Ore. It is one of the largest bridges in Tallamook county, being 182 feet long and sixteen feet wide. The amount of lumber in the bridge is 47,000 feet, and every stick of it was gotten out on the ground within 100 feet of the site of the bridge with a whip-saw and broad-ax.

STREET LIGHTING.

Roanoke, Va., is to have electric lights.

A $20,000 municipal electric light plant will be built at Hannibal, Mo.

The citizens of Hampton, Ia., have voted in favor of an electric light plant.

The practicability of an electric light is being considered at Shelbyville, Ky.

An electric light plant is to be erected by the city street car company at Staunton, Va.

The citizens of Rockville, Conn., have voted to construct a municipal electric plant to cost $25,000.

The city council at Richmond, Va., is considering an ordinance to appropriate $125,000 for a municipal plant.

A local company has offered to put in 20 arc lights of 2,000 c. p. each at $60 per light per year at Kittanning, Pa.

The N. O. Nelson Manufacturing Company have been awarded the contract for lighting the streets of Edwardsville, Ill., with electricity.

At South Omah, Neb., an electric light plant will be put in by a company recently organized by J. A. McShane, W. A. Paxton and E. A. Cudahy.

The Wellsburg Electric Light, Heat and Power Company of Wellsburg, W. Va., will increase its capital stock to make additions to its plant.

The city council of Waco, Texas, is considering a proposition from the Franklin Light Co., Kansas City, Mo., for the erection of a municipal plant.

Preliminary plans for an electric light plant for Chester, Ill., have been completed by W. H. Bryan, of St. Louis, Mo. There will be 1,000 incandescent and 50 arc lights at the start.

The city council of Kansas City, Kan., has passed an ordinance accepting the proposition of the Fort Wayne Electric Company to construct a plant for that city and a special election will be held in December at which the people will vote on the proposition.

The city council of Sacramento, Cal., has granted a franchise to the Folsom Water Power Company to introduce electricity into the city for lighting and power purposes. The electricity will be generated by water power at Folsom, a distance of twenty miles, and it is claimed that several thousand horse-power will be transmitted to the city.

A GOVERNMENT COMPLIMENT.

The Wellington Machine Company, of Wellington, O., feel highly complimented from the fact that they have received a request from the Commissioner of Patents, for a model of their "Monarch" brick machine to be exhibited at the World's Columbian Exposition.

In making the request, the commissioner states that it has been selected as a machine marking a *distinct advance* in the art, and illustrating such an invention as should properly be included in the proposed government exhibit.

This machine is attracting marked attention on account of the high performance of those that have been used the past two years, and gives promise of being a wonderful success. The Wellington Machine Company, who manufacture it, have already received orders for three of them for next season's delivery. It certainly shows excellence when purchasers will send in their orders six months in advance of the time they wish the machine.

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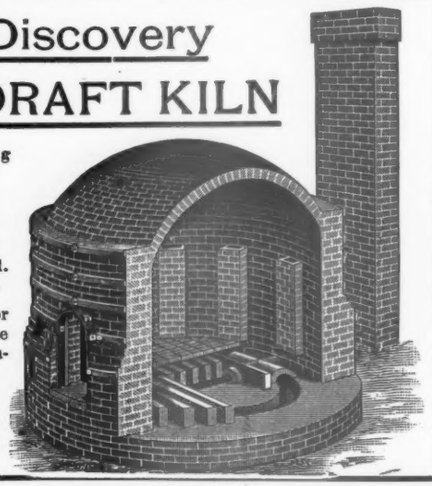

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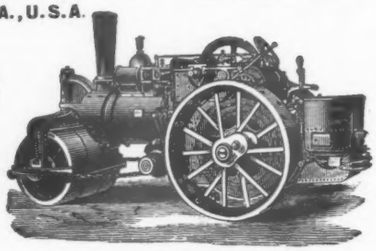

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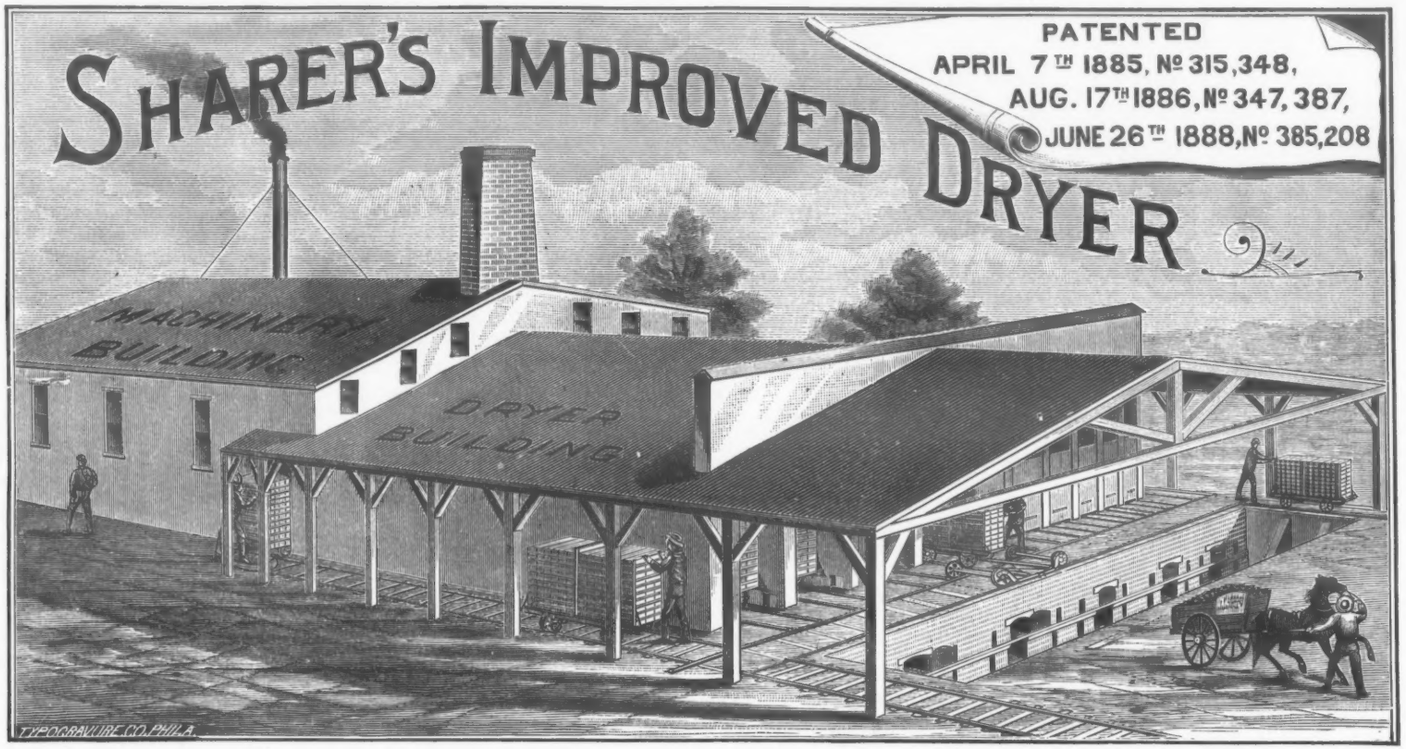

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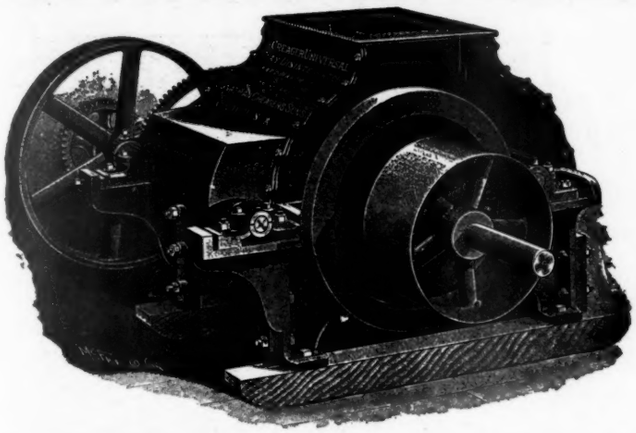

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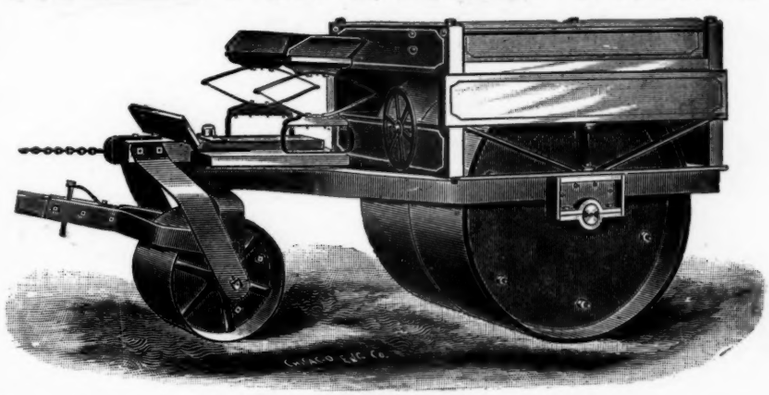

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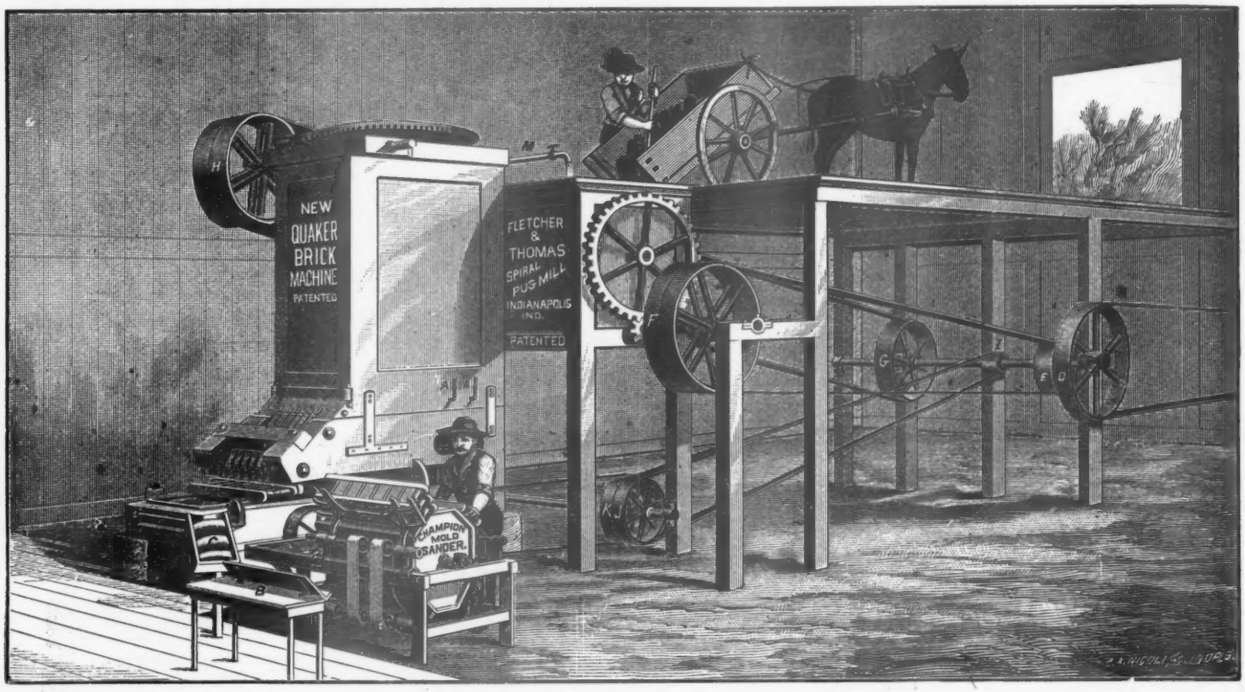

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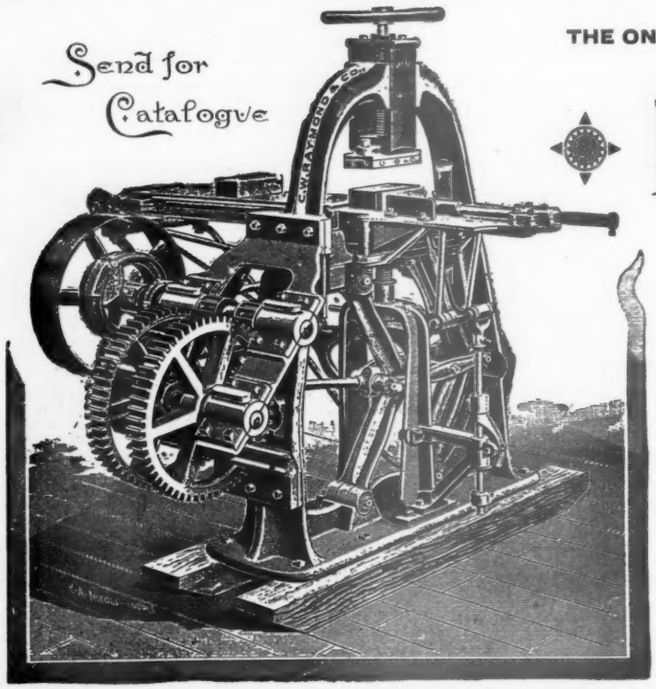

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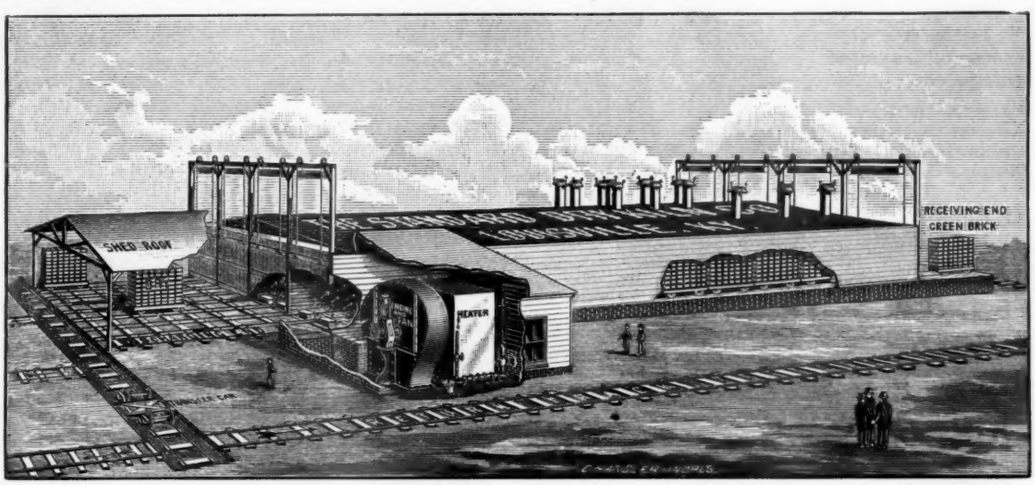

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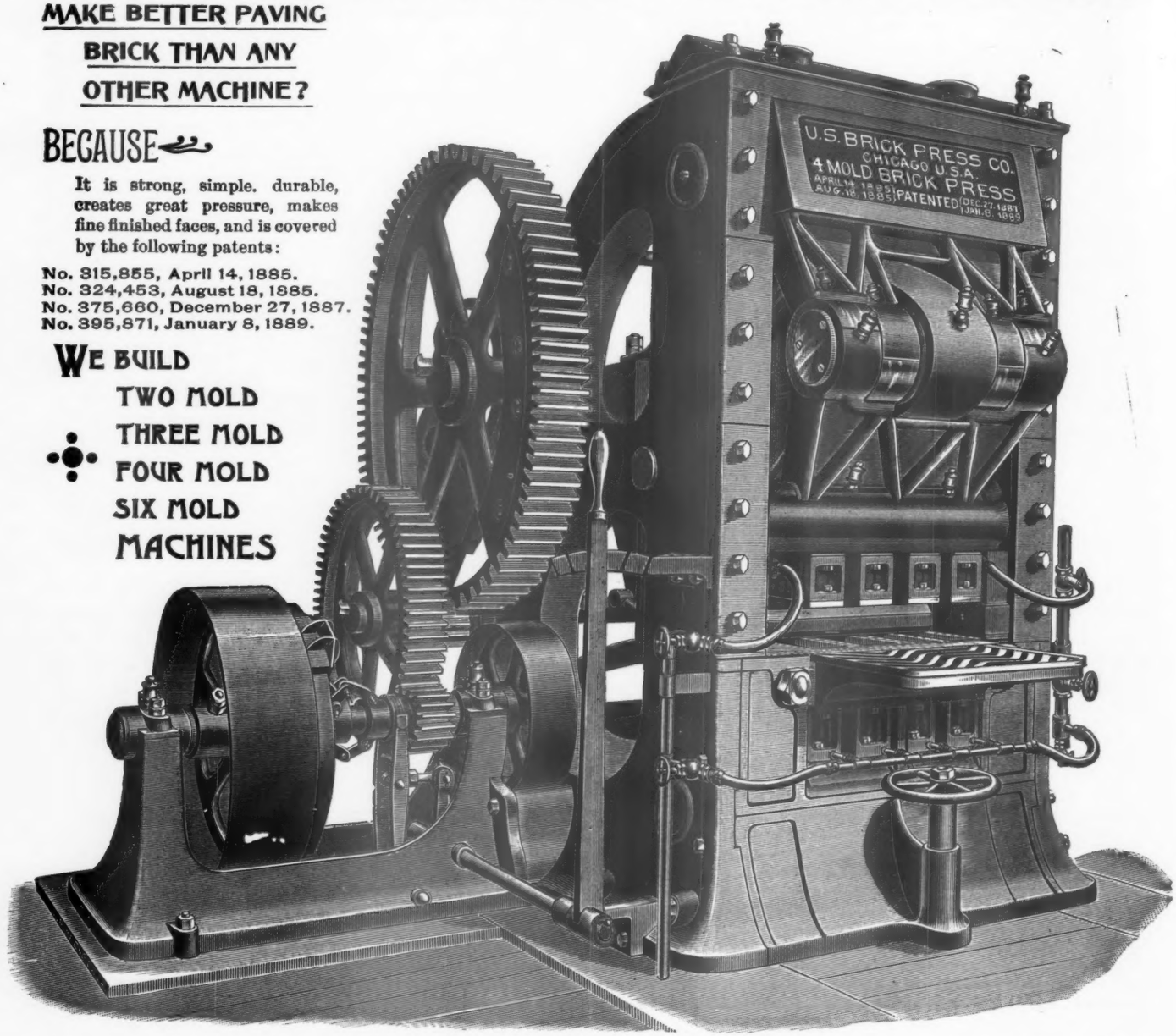

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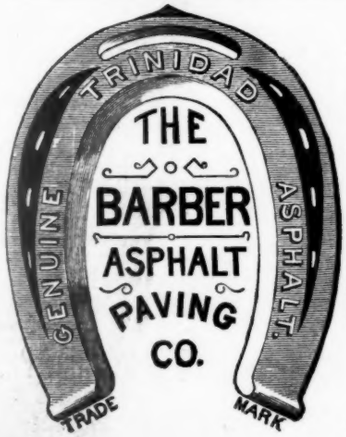

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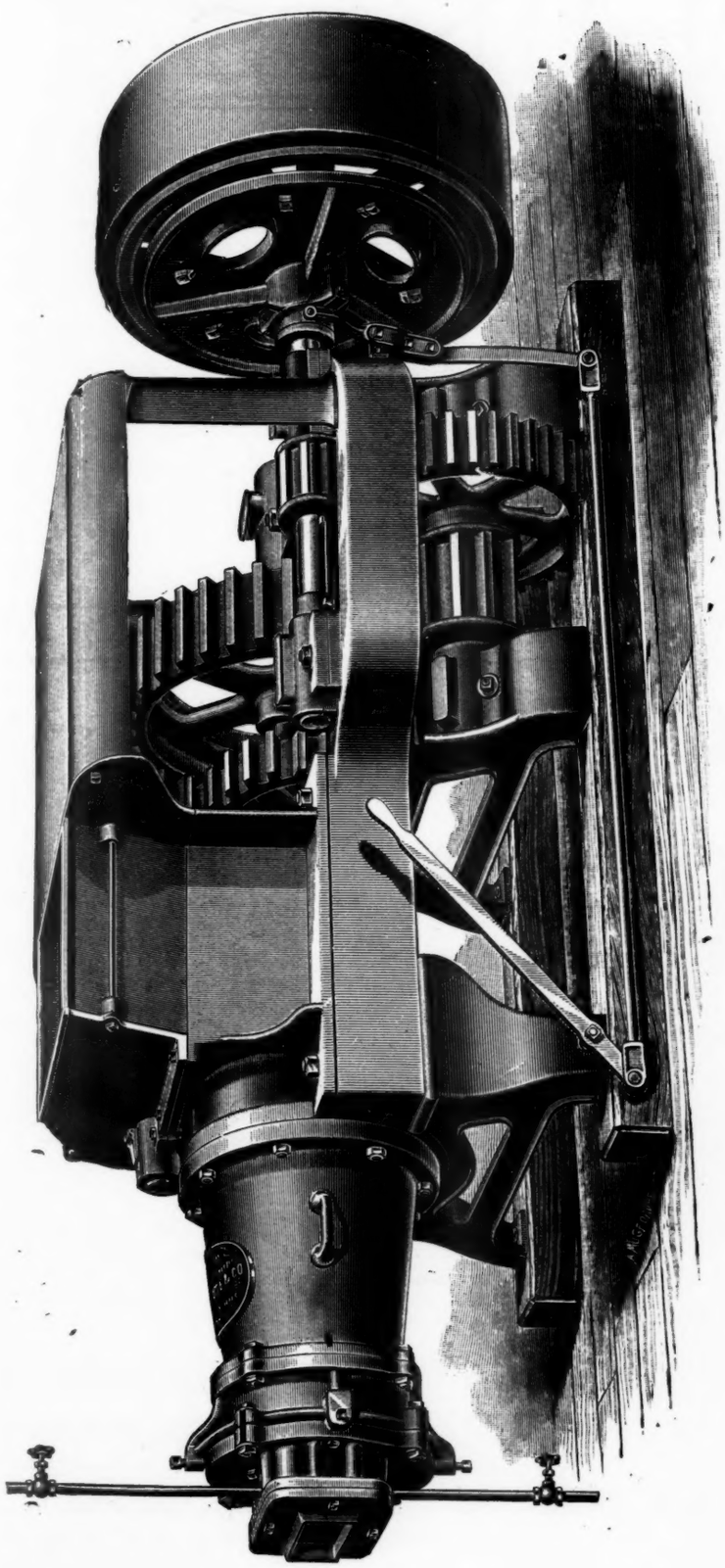

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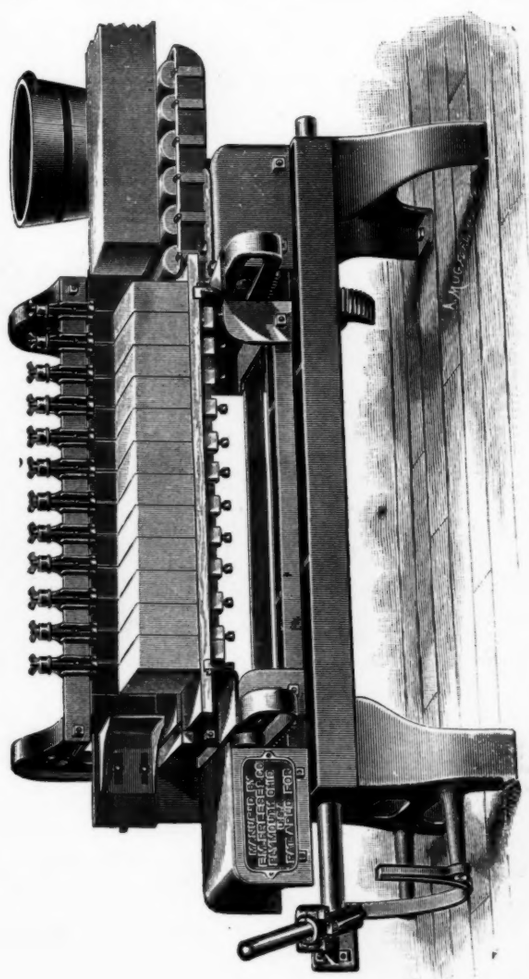

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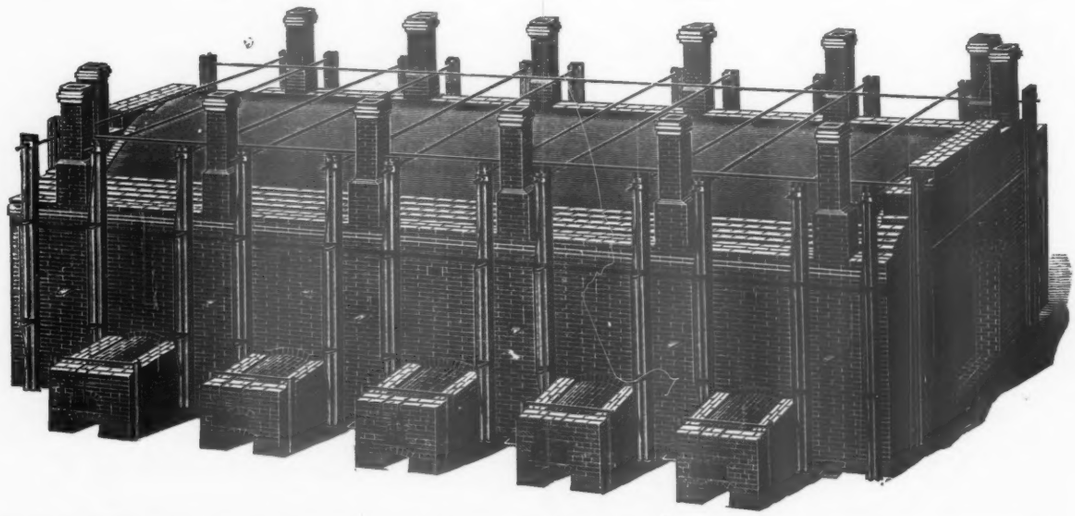

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